ELEC8203

Power Systems Protection

Session 2, In person-scheduled-weekday, North Ryde 2025

School of Engineering

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General Information

Unit convenor and teaching staff
Unit Convener/Lecturer
Sara Deilami
sara.deilami@mq.edu.au
Contact via Via email
Room # 119, Level 1 , 44 WTR
Wednesdays and Thursdays (12pm- 1pm), by appointment only

Lab Demonstrator
Adithya Ravikumar
adithya.ravikumar@mq.edu.au
Contact via Via email
n/a

Credit points
10

Prerequisites
40 CP at 6000 level or above

Corequisites

Co-badged status

Unit description
This unit offers the protection of modern power systems, introducing different schemes, equipment, and technologies essential for ensuring network reliability and security across key parts of power system. It familiarizes students with fundamental concepts and basics of power system protection elements, fault analysis, and the application of protection schemes such as overcurrent protection, differential protection and distance protection along with the introduction of digital relaying. It also covers different protection techniques for renewable energy sources, analysing their challenges and implications within power 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; 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: Identify the foundational principles of power system protection, including the significance of fault analysis and the essential components of protection systems.
ULO2: Analyse and apply different protection schemes, such as overcurrent, differential, and distance relays, for key elements of power systems such as transmission lines, generators, transformers, and distribution networks.
ULO3: Evaluate the significance of advanced technologies, including digital relays, integration of phasor measurement units and communication protocols in modern power systems.
ULO4: Acquire knowledge in protection techniques for renewable energy systems such as solar PV systems.
ULO5: Assess and investigate the challenges and potential solutions in implementing advanced power system protection schemes, considering renewable energy integration.
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

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 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 is provided to students who experience a technical concern.

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.

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 - NO, unless Special Consideration is Granted

Project Assessment – YES, Standard Late Penalty applies

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	Week 8		No	
Class Quiz	30%	No	Week 8		No	
Project assessment	40%	No	Week 13 & 14		No	

Assignment

Assessment Type [1]: Practice-based task
Indicative Time on Task [2]: 20 hours
Due: **Week 8**
Weighting: **30%**
Groupwork/Individual:
Short extension [3]: No
AI Approach:

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:

- Analyse and apply different protection schemes, such as overcurrent, differential, and distance relays, for key elements of power systems such as transmission lines, generators, transformers, and distribution networks.
- Acquire knowledge in protection techniques for renewable energy systems such as solar PV systems.
- 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]: Quiz/Test
Indicative Time on Task [2]: 15 hours
Due: **Week 8**
Weighting: **30%**
Groupwork/Individual:
Short extension [3]: No
AI Approach:

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

On successful completion you will be able to:

- Identify the foundational principles of power system protection, including the significance of fault analysis and the essential components of protection systems.
- Analyse and apply different protection schemes, such as overcurrent, differential, and distance relays, for key elements of power systems such as transmission lines, generators, transformers, and distribution networks.
- Evaluate the significance of advanced technologies, including digital relays, integration of phasor measurement units and communication protocols in modern power systems.
- Acquire knowledge in protection techniques for renewable energy systems such as solar PV systems.
- Assess and investigate the challenges and potential solutions in implementing

advanced power system protection schemes, considering renewable energy integration.

Project assessment

Assessment Type [1]: Project
Indicative Time on Task [2]: 25 hours
Due: **Week 13 & 14**
Weighting: **40%**
Groupwork/Individual:
Short extension [3]: No
AI Approach:

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:

- Analyse and apply different protection schemes, such as overcurrent, differential, and distance relays, for key elements of power systems such as transmission lines, generators, transformers, and distribution networks.
- Evaluate the significance of advanced technologies, including digital relays, integration of phasor measurement units and communication protocols in modern power systems.
- Acquire knowledge in protection techniques for renewable energy systems such as solar PV systems.
- Assess and investigate the challenges and potential solutions in implementing advanced power system protection schemes, considering renewable energy integration.
- Work effectively in teams by identifying individual roles and responsibilities, sharing knowledge through peer-led learning, writing technical reports and logbooks, and effective communications.

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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

- Protection of Electricity Distribution Networks, 3nd 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 this textbook.*
- Support Website: https://digital-library.theiet.org/doi/10.1049/pbpo065e_ch2

LECTORIALS

- Lectorials take place twice a week (Weeks 1-7) according to the Unit schedule.
    - *Note! Students are strongly encouraged to participate in the 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.

LABORATORIES

- 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, Siemens Digital Relays and DigSilent Power Factory software platform to assist with the Lab experiments.

On-campus activities commence in Week 2. Students should contact the Unit convenor as soon as possible if they are unable to get back to campus in time.

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;*

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

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

Unit Schedule

For details, please refer to the Unit Schedule on the ELEC8203 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.

- Workshops
- Chat with a WriteWISE peer writing leader
- 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 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.

Engineers Australia Competency

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
	1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing.	ULO1, ULO2, ULO3, ULO4, ULO6
	1.3 In-depth understanding of specialist bodies of knowledge	ULO1, ULO2, ULO3, ULO4, ULO5
	1.4 Discernment of knowledge development and research directions	ULO5

EA Competency Standard		Unit Learning Outcomes
	1.5 Knowledge of engineering design practice	ULO1, ULO2, ULO3, ULO4, ULO5, ULO6
	1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice.	ULO2, ULO3, ULO4, ULO5
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, ULO6
	2.3 Application of systematic engineering synthesis and design processes.	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.	ULO5, ULO6
	3.3 Creative, innovative and pro-active demeanour.	ULO3
	3.4 Professional use and management of information.	ULO2, ULO5
	3.5 Orderly management of self, and professional conduct.	ULO4
	3.6 Effective team membership and team leadership	ULO3

Unit information based on version 2025.04 of the Handbook