ENEE13016 *Power System Protection*
Term 1 - 2018

Profile information current as at 29/04/2024 08:48 pm

All details in this unit profile for ENEE13016 have been officially approved by CQUniversity and represent a learning partnership between the University and you (our student). The information will not be changed unless absolutely necessary and any change will be clearly indicated by an approved correction included in the profile.

Corrections

Unit Profile Correction added on 19-02-18
Details Section of the examination Calculator - non-programmable, no text retrieval, silent only

Unit Profile Correction added on 05-04-18
Details Section of the examination Duration 3 hours

Unit Profile Correction added on 05-04-18

General Information

Overview

Students analyse and design devices and schemes to protect electrical power apparatus and systems. They explain the philosophy, principles, concepts and practices, the codes, standards and manuals that guide design and operation of protection schemes They analyse protection schemes, solve protection problems and correct faults. Students identify requirements, analyse and design protection for power system networks and for apparatus in electrical power systems. They develop fluency in the technical language of power systems protection and develop professional skills needed to communicate, learn and work alone and collaboratively to solve problems and document the solution process. Distance education (FLEX) students are required to have access to a computer and make frequent use of the Internet.

Details

Career Level: *Undergraduate*
Unit Level: *Level 3*
Credit Points: *6*
Student Contribution Band: *8*
Fraction of Full-Time Student Load: *0.125*

Pre-requisites or Co-requisites

ENEE 12015 Electrical Power Engineering or ENEE12004 Introduction to Power Systems or ENTE12005 Electrical Power Systems
Important note: Students enrolled in a subsequent unit who failed their pre-requisite unit, should drop the subsequent unit before the census date or within 10 working days of Fail grade notification. Students who do not drop the unit in this timeframe cannot later drop the unit without academic and financial liability. See details in the Assessment Policy and Procedure (Higher Education Coursework).

Offerings For Term 1 - 2018

- Bundaberg
- Cairns
- Distance
- Gladstone
- Mackay
- Rockhampton

Attendance Requirements

All on-campus students are expected to attend scheduled classes – in some units, these classes are identified as a mandatory (pass/fail) component and attendance is compulsory. International students, on a student visa, must maintain a full time study load and meet both attendance and academic progress requirements in each study period (satisfactory attendance for International students is defined as maintaining at least an 80% attendance record).

Website

This unit has a website, within the Moodle system, which is available two weeks before the start of term. It is important that you visit your Moodle site throughout the term. Please visit Moodle for more information.

Class and Assessment Overview

Recommended Student Time Commitment

Each 6-credit Undergraduate unit at CQUniversity requires an overall time commitment of an average of 12.5 hours of study per week, making a total of 150 hours for the unit.

Class Timetable

Regional Campuses
Bundaberg, Cairns, Emerald, Gladstone, Mackay, Rockhampton, Townsville

Metropolitan Campuses
Adelaide, Brisbane, Melbourne, Perth, Sydney

Assessment Overview

1. **Written Assessment**
Weighting: 30%
2. **Online Quiz(zes)**
Weighting: 30%
3. **Examination**
Weighting: 40%
4. **Written Assessment**
Weighting: Pass/Fail

Assessment Grading

This is a graded unit: your overall grade will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. You must obtain an overall mark for the unit of at least 50%, or an overall grade of 'pass' in order to pass the unit. If any 'pass/fail' tasks are shown in the table above they must also be completed successfully ('pass' grade). You must also meet any minimum mark requirements specified for a particular assessment task, as detailed in the 'assessment task' section (note that in some instances, the minimum mark for a task may be greater than 50%). Consult the University's Grades and Results Policy for more details of interim results and final grades.

CQUniversity Policies

All University policies are available on the CQUniversity Policy site.
You may wish to view these policies:

- Grades and Results Policy
- Assessment Policy and Procedure (Higher Education Coursework)
- Review of Grade Procedure
- Student Academic Integrity Policy and Procedure
- Monitoring Academic Progress (MAP) Policy and Procedure – Domestic Students
- Monitoring Academic Progress (MAP) Policy and Procedure – International Students
- Student Refund and Credit Balance Policy and Procedure
- Student Feedback – Compliments and Complaints Policy and Procedure
- Information and Communications Technology Acceptable Use Policy and Procedure

This list is not an exhaustive list of all University policies. The full list of University policies are available on the CQUniversity Policy site.

Previous Student Feedback

Feedback, Recommendations and Responses

Every unit is reviewed for enhancement each year. At the most recent review, the following staff and student feedback items were identified and recommendations were made.

Feedback from Student evaluations

Feedback

A good unit overall, but one thing that would be appreciated is a grading rubric/criteria sheet for the assignment, as it is a major part of the unit

Recommendation

A criteria sheet / check list will be added to the assignment documentation.

Unit Learning Outcomes

On successful completion of this unit, you will be able to:

1. Describe and explain the philosophy, principles, concepts and practices that are the foundation of electric power systems protection [2, 3, 5, 7, 8, 9]
2. Identify, explain the scope and standing of, and apply codes, standards and manuals used to guide design and operation of electric power systems protection [2, 3, 10]
3. Analyse power protection systems, modify and design such systems to solve problems and correct faults [3, 4, 5]
4. Describe devices and schemes used to provide protection in power systems, explain their operation and design protection devices and schemes to operate in given situations [1, 2, 3, 4, 5]
5. Identify apparatus that require protection in power systems, explain the nature of the protection they required and design protection schemes for these apparatus [1, 2, 3, 4, 5]
6. Describe the types of protection required in power systems networks, explain the nature of the protection required and design protection schemes for these networks [1, 2, 3, 4, 5]
7. Communicate effectively using electrical power systems protection terminology, symbols and diagrams [1, 2, 3]
8. Work and learn autonomously and collaboratively to solve problems, record and communicate clearly and professionally the approach used to solve problems and the reasons for adopting such approaches to the problem [2, 6, 9, 10]

Numbers in brackets show Graduate Attributes (abbreviated) below promoted by each Learning Outcome above.
BEng GAs BEngTech GAs
1. science and engineering
2. communicate effectively
3. technical competence
4. problem solution
5. systems
6. function in teams
7. social, cultural, global and environmental
8. sustainable design and development
9. professionalism and ethics
10. lifelong learning

Alignment of Learning Outcomes, Assessment and Graduate Attributes

Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes							
	1	2	3	4	5	6	7	8
1 - Written Assessment - 30%	•	•	•	•	•	•	•	•
2 - Online Quiz(zes) - 30%		•	•	•		•		
3 - Examination - 40%		•	•			•		
4 - Written Assessment - 0%	•	•	•	•	•	•	•	•

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes							
	1	2	3	4	5	6	7	8
1 - Communication	•	•	•	•	•	•	•	•
2 - Problem Solving	•	•	•	•	•	•	•	•
3 - Critical Thinking	•	•	•	•	•	•	•	•
4 - Information Literacy	•	•	•	•	•	•	•	•
5 - Team Work	•	•	•	•	•	•	•	•
6 - Information Technology Competence	•	•	•	•	•	•	•	•
7 - Cross Cultural Competence								
8 - Ethical practice	•	•	•	•	•	•	•	•
9 - Social Innovation								
10 - Aboriginal and Torres Strait Islander Cultures								

Alignment of Assessment Tasks to Graduate Attributes

Assessment Tasks	Graduate Attributes									
	1	2	3	4	5	6	7	8	9	10
1 - Written Assessment - 30%	•	•	•		•			•		
2 - Online Quiz(zes) - 30%		•								
3 - Examination - 40%		•	•							
4 - Written Assessment - 0%	•	•	•							

Textbooks and Resources

Textbooks

There are no required textbooks.

Additional Textbook Information
This course will utilise freely available materials including the Network Protection and Automation Guide which may be obtained at
http://www.alstom.com/grid/products-and-services/Substation-automation-system/protection-relays/Network-Protection-Automation-Guide-NEW-2011-Edition/

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)

Referencing Style

All submissions for this unit must use the referencing style: Harvard (author-date)
For further information, see the Assessment Tasks.

Teaching Contacts

Shaminda De Silva Unit Coordinator
s.desilva@cqu.edu.au
Peter Wolfs Unit Coordinator
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Schedule

Week 1 - 05 Mar 2018

Module/Topic	Chapter	Events and Submissions/Topic
Protection system fundamentals	NPAG Chapter 2; Reading Topic 1	

Week 2 - 12 Mar 2018

Module/Topic	Chapter	Events and Submissions/Topic
Current transformers	NPAG Chapter 6 sections 6.4.1 to 6.4.9; Reading Topic 2	

Week 3 - 19 Mar 2018

Module/Topic	Chapter	Events and Submissions/Topic
Over current protection	NPAG Chapter 9 sections 9.1 to 9.9; Reading Topic 3 pages 3-1 to 3-9.	

Week 4 - 26 Mar 2018

Module/Topic	Chapter	Events and Submissions/Topic
Over current protection	NPAG Chapter 9 sections 9.10 to 9.18; Reading Topic 3 pages 3-10 to 3-19.	Work book formative feedback opportunity 1

Week 5 - 02 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic

Transformer protection	NPAG Chapter 16 sections 16.1 to 16.8	On-line class test 1 due

Vacation Week - 09 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 16 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic
Transformer protection	NPAG Chapter 16 sections 16.9 to 16.16; Reading Topic 6.	Assignment feedback opportunity 1

Week 7 - 23 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic
Distance (impedance) protection	NPAG Chapter 11 sections 11.1 to 11.8; Reading Topic 5 pages 5-1 to 5-9.	On-line class test 2 due

Week 8 - 30 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic
Distance (impedance) protection	NPAG Chapter 11 sections 11.9 to 11.13; Chapter 12. Reading Topic 5 pages 5-20 to 5-33.	Assignment feedback opportunity 2

Week 9 - 07 May 2018

Module/Topic	Chapter	Events and Submissions/Topic
Motor/Generator protection	NPAG Chapters 17 and 19; Reading Topic 6.	Work book formative feedback opportunity 2

Week 10 - 14 May 2018

Module/Topic	Chapter	Events and Submissions/Topic
Feeder protection	NPAG Chapter 9 sections 9.19 to 9.21; Chapter 10.	On-line class test 3 due Assignment feedback opportunity 3

Week 11 - 21 May 2018

Module/Topic	Chapter	Events and Submissions/Topic
Coordinating protection schemes in a substation	NPAG Chapters 24 and 25.	

Week 12 - 28 May 2018

Module/Topic	Chapter	Events and Submissions/Topic
		Assignment Due
Review		**Substation Protection Assignment** Due: Week 12 Friday (1 June 2018) 11:59 pm AEST

Review/Exam Week - 04 Jun 2018

Module/Topic	Chapter	Events and Submissions/Topic
		Workbook Due: Review/Exam Week Friday (8 June 2018) 11:59 pm AEST

Exam Week - 11 Jun 2018

Module/Topic	Chapter	Events and Submissions/Topic

Term Specific Information

Assessment Tasks

1 Substation Protection Assignment

Assessment Type
Written Assessment

Task Description
Review and analyse selected features of an integrated zone substation protection system. The major technical deliverables are: A simplified protection diagram; The identification of suitable protection zones; Determining suitable protection schemes within each zone; Identifying suitable commercial equipment; Demonstrating that the actions of the protection schemes are co-ordinated; Determining specified key parameters for protection equipment. Students will present an engineering report that includes a Simplified Protection Diagram; A Design Summary and a Main Body. Page limits apply.
Three optional formative feedback opportunities on specific assignment tasks are available in weeks six, eight and ten.
This is a team based assessment. The preferred team size is two. Where circumstances exist, the team size can vary. Teams can self-select their members and must advise the lecturer of the team membership via email before the end of week two. For team based assignments will be submitted with a written statement outlining the contribution of each team member.
The full assignment document is available through Moodle before the start of the term.

Assessment Due Date
Week 12 Friday (1 June 2018) 11:59 pm AEST
Submit on line

Return Date to Students
Exam Week Friday (15 June 2018)
Returned on line.

Weighting
30%

Minimum mark or grade
15/30

Assessment Criteria
The Simplified Protection Diagram
It is acceptable to hand draw the diagram (CAD can take time). The diagram should show clearly:
The primary plant – transformers, breakers and busbars

- The CT and VT locations
- The protection relays with a single line connection to their inputs (generally CTs and VTs) and outputs (circuit breaker operating coils). Show the IEEE device numbers on the relays.

To achieve clarity of presentation the simplified drawing can omit:
Interconnections between the relays;

- The relay tables;
- Details of the housekeeping power supplies.

Design Summary
The design summary would be expected to refer to the protection diagram. It should:

1. Identify the protection zones;
2. For each protection zone specify:
    a. The protection schemes to be applied;
    b. How backup protection is achieved;
    c. The placement of CTs and VTs;
    d. Provide the basic ratings for CTs and VTs;
    e. For overcurrent protection schemes only, give suitable relay settings.

Main Body
Provide an overview of the protection zones and protection schemes;

1. For each protection zone your plan will specify:
    a. Provide a brief rationale for the selection of the scheme(s);
    b. Provide a brief rationale the placement of CTs and VTs;

c. Outline the calculations for the ratings of CTs and VTs;
d. Outline the calculations for overcurrent relay settings;
e. Provide recommendations for suitable commercial relays.

1. For each protection zone, give at least two examples of how the protection system will safely and reliably detect and isolate faults within the protection zone. One fault will be a earth fault, one fault will be a line to line fault;
2. For each protection zone, give at least one example of how the protection system will discriminate against a fault outside of the protection zone.

This is a team based assignment.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Please submit electronic version of your assignment through Moodle.

Learning Outcomes Assessed

- Describe and explain the philosophy, principles, concepts and practices that are the foundation of electric power systems protection [2, 3, 5, 7, 8, 9]
- Identify, explain the scope and standing of, and apply codes, standards and manuals used to guide design and operation of electric power systems protection [2, 3, 10]
- Analyse power protection systems, modify and design such systems to solve problems and correct faults [3, 4, 5]
- Describe devices and schemes used to provide protection in power systems, explain their operation and design protection devices and schemes to operate in given situations [1, 2, 3, 4, 5]
- Identify apparatus that require protection in power systems, explain the nature of the protection they required and design protection schemes for these apparatus [1, 2, 3, 4, 5]
- Describe the types of protection required in power systems networks, explain the nature of the protection required and design protection schemes for these networks [1, 2, 3, 4, 5]
- Communicate effectively using electrical power systems protection terminology, symbols and diagrams [1, 2, 3]
- Work and learn autonomously and collaboratively to solve problems, record and communicate clearly and professionally the approach used to solve problems and the reasons for adopting such approaches to the problem [2, 6, 9, 10]

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Team Work
- Ethical practice

2 Online Quizzes

Assessment Type
Online Quiz(zes)

Task Description
Three on line quizzes covering weeks 1-4; 5-6 and 7-9. Most questions are multiple choice and most questions require some calculations to select a correct answer. Several attempts at each quiz are allowed but at each attempt new (but similar) questions are presented. Quizzes contain between ten and twenty questions. Most students will require less than one hour to complete a quiz attempt.

Number of Quizzes
3

Frequency of Quizzes
Other

Assessment Due Date

As stated in the weekly schedule.

Return Date to Students

Marks will be available in the Moodle on completion of the quiz.

Weighting
30%

Assessment Criteria
The three quizzes total 30 marks. Ten marks per quiz.

Referencing Style

- Harvard (author-date)

Submission
Online

Learning Outcomes Assessed

- Identify, explain the scope and standing of, and apply codes, standards and manuals used to guide design and operation of electric power systems protection [2, 3, 10]
- Analyse power protection systems, modify and design such systems to solve problems and correct faults [3, 4, 5]
- Describe devices and schemes used to provide protection in power systems, explain their operation and design protection devices and schemes to operate in given situations [1, 2, 3, 4, 5]
- Describe the types of protection required in power systems networks, explain the nature of the protection required and design protection schemes for these networks [1, 2, 3, 4, 5]

Graduate Attributes

- Problem Solving

3 Workbook

Assessment Type
Written Assessment

Task Description
Your work book should contain the worked solutions to the weekly tutorials and exercises. The workbook is also used to record work performed while completing your substation design assignment. This will include calculations and diagrams. Previous years have shown a strong direct correlation between the quality of the workbook submission and the final exam result. There are several key skills that are centrally important for a power systems protection engineer. Practice is required to ensure standard calculations can be performed reliably.The workbook task is intended to encourage students to undertake sufficient practice to ensure that standard protection methods can be properly applied.

Assessment Due Date
Review/Exam Week Friday (8 June 2018) 11:59 pm AEST

Return Date to Students
Exam Week Friday (15 June 2018)
Feedback will be given online

Weighting
Pass/Fail

Assessment Criteria
Content - reasonable attempts should be present for 75% tutorial activities and in support of the protection assignment. The work book should illustrate a capacity to perform calculations accurately, with an understanding of significant figures and with the correct use of the SI engineering units. Scan the workbook to produce a single PDF for submission. A optional formative feedback opportunity will be available at the end of weeks 4 and 9. Students will be able to submit their workbooks for informal (non-graded) feedback and guidance.
The workbook submissions are made on an individual basis.

Referencing Style

- Harvard (author-date)

Submission
Online

Learning Outcomes Assessed

- Describe and explain the philosophy, principles, concepts and practices that are the foundation of electric power systems protection [2, 3, 5, 7, 8, 9]
- Identify, explain the scope and standing of, and apply codes, standards and manuals used to guide design and operation of electric power systems protection [2, 3, 10]

- Analyse power protection systems, modify and design such systems to solve problems and correct faults [3, 4, 5]
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- Communicate effectively using electrical power systems protection terminology, symbols and diagrams [1, 2, 3]
- Work and learn autonomously and collaboratively to solve problems, record and communicate clearly and professionally the approach used to solve problems and the reasons for adopting such approaches to the problem [2, 6, 9, 10]

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking

Examination

Outline
Complete an invigilated examination.

Date
During the examination period at a CQUniversity examination centre.

Weighting
40%

Length
180 minutes

Minimum mark or grade
50

Exam Conditions
Restricted.

Materials
Dictionary - non-electronic, concise, direct translation only (dictionary must not contain any notes or comments).
Calculator - non-programmable, no text retrieval, silent only

Academic Integrity Statement

As a CQUniversity student you are expected to act honestly in all aspects of your academic work.

Any assessable work undertaken or submitted for review or assessment must be your own work. Assessable work is any type of work you do to meet the assessment requirements in the unit, including draft work submitted for review and feedback and final work to be assessed.

When you use the ideas, words or data of others in your assessment, you must thoroughly and clearly acknowledge the source of this information by using the correct referencing style for your unit. Using others' work without proper acknowledgement may be considered a form of intellectual dishonesty.

Participating honestly, respectfully, responsibly, and fairly in your university study ensures the CQUniversity qualification you earn will be valued as a true indication of your individual academic achievement and will continue to receive the respect and recognition it deserves.

As a student, you are responsible for reading and following CQUniversity's policies, including the **Student Academic Integrity Policy and Procedure**. This policy sets out CQUniversity's expectations of you to act with integrity, examples of academic integrity breaches to avoid, the processes used to address alleged breaches of academic integrity, and potential penalties.

What is a breach of academic integrity?
A breach of academic integrity includes but is not limited to plagiarism, self-plagiarism, collusion, cheating, contract cheating, and academic misconduct. The Student Academic Integrity Policy and Procedure defines what these terms mean and gives examples.

Why is academic integrity important?
A breach of academic integrity may result in one or more penalties, including suspension or even expulsion from the University. It can also have negative implications for student visas and future enrolment at CQUniversity or elsewhere. Students who engage in contract cheating also risk being blackmailed by contract cheating services.

Where can I get assistance?
For academic advice and guidance, the Academic Learning Centre (ALC) can support you in becoming confident in completing assessments with integrity and of high standard.

What can you do to act with integrity?

Be Honest
If your assessment task is done by someone else, it would be dishonest of you to claim it as your own

Seek Help
If you are not sure about how to cite or reference in essays, reports etc, then seek help from your lecturer, the library or the Academic Learning Centre (ALC)

Produce Original Work
Originality comes from your ability to read widely, think critically, and apply your gained knowledge to address a question or problem