ENEE13021 *Power System Analysis and Design*
Term 2 - 2020

Profile information current as at 23/04/2024 10:01 pm

General Information

Overview
Students should be able to work in teams to model, analyse and investigate design and operation options for electrical power networks to meet community service requirements. On satisfactory completion students should be able to analyse steady state power system performance and articulate the process of updating and maintaining power network assets in order so they meet safety, reliability, availability, security, and quality requirements for both present and future society needs.

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
ENEE12015 Electrical Power Engineering
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 2 - 2020

- Bundaberg
- Cairns
- Gladstone
- Mackay
- Online
- 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. **Practical and Written Assessment**
Weighting: 15%
2. **Online Quiz(zes)**
Weighting: 20%
3. **Written Assessment**
Weighting: 30%
4. **Take Home Exam**
Weighting: 35%

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 survey

Feedback
Students request publication of more detailed assessment rubrics in advance.

Recommendation
Publish more detailed assessment rubrics along with assessment items at the start of term.

Feedback from Student survey

Feedback
Students request faster assessment return.

Recommendation
Involve markers to do this if necessary. Also structure assessment will be re-visited to avoid two assessments being due on the same day.

Unit Learning Outcomes

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

1. Discuss the difference between balanced and unbalanced operation of power systems
2. Analyse, using appropriate software tools, power system performance in both balanced and unbalanced modes of operation
3. Calculate fault currents and power flow in power systems and discuss the selection of appropriate protection schemes
4. Understand the power flow problem along with the methods of solutions and appreciate the relevance of power flow studies in power system planning and operation
5. Investigate and report the process of updating and maintaining power network assets in order so they meet safety, reliability, availability, security, and quality requirements for both present and future society needs
6. Explain the difference between dynamic stability and transient stability and investigate tools that could be used to analyse the power system for voltage and power angle stability performance
7. Communicate effectively using power systems terminology, symbols and diagrams adhering to Australian Standards and present design documents, solutions, and calculations professionally
8. Work collaboratively and autonomously to solve problems and record and communicate clearly and professionally the approach used to solve problems.

The Learning Outcomes for this unit are linked with Engineers Australia's Stage 1 Competency Standard for Professional Engineers.

Alignment of Learning Outcomes, Assessment and Graduate Attributes

— N/A Level • Introductory Level • Intermediate Level • Graduate Level ◦ Professional Level ◦ Advanced Level

Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes							
	1	2	3	4	5	6	7	8
1 - Practical and Written Assessment - 15%	•	•	•		•		•	•

Assessment Tasks	Learning Outcomes							
	1	2	3	4	5	6	7	8
2 - Written Assessment - 30%	•	•	•	•	•	•	•	•
3 - Online Quiz(zes) - 20%		•		•	•	•		
4 - Take Home Exam - 35%				•	•	•	•	•

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 - Practical and Written Assessment - 15%	•	•	•					•		
2 - Written Assessment - 30%	•	•	•		•			•		

Textbooks and Resources

Textbooks

ENEE13021

Prescribed

Power System Analysis and Design
Edition: 6th edn (2016)
Authors: J. Duncan Glover, Thomas Overbye, and Mulukutla Sarma
CENGAGE Learning
Boston , MA , USA
ISBN: 9781305636187
Binding: Paperback

Additional Textbook Information
Copies can be purchased from the CQUni Bookshop here: http://bookshop.cqu.edu.au (search on the Unit code)

View textbooks at the CQUniversity Bookshop

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- Access to a document scanner and a pdf converter
- Computer with Windows OS, headphones & microphone
- The free version of PowerWorld Simulator - downloadable from the internet

Referencing Style

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

Teaching Contacts

Ehsan Pashajavid Unit Coordinator
e.pashajavid@cqu.edu.au

Schedule

Week 1 - 13 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
Introduction to power systems analysis	Chapters1 & 2 of Glover, Sarma, and Overbye	

Week 2 - 20 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
Introduction to Power System Modelling	Chapters 3 & 4 of Glover, Sarma, and Overbye	

Week 3 - 27 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
Symmetrical Components	Chapter 8 of Glover, Sarma, and Overbye	

Week 4 - 03 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Fault Analysis	Chapter 8&9 of Glover, Sarma, and Overbye	

Week 5 - 10 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Modelling of Power System Networks	Chapter 5 of Glover, Sarma, and Overbye	

Vacation Week - 17 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 24 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Introduction to Load Flow Analysis	Chapter 6 of Glover, Sarma, and Overbye	**Assignment 1 (Individual Submission)** Due: Week 6 Friday (28 Aug 2020) 11:45 pm AEST

Week 7 - 31 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
Load Flow Algorithms	Chapter 6 of Glover, Sarma, and Overbye	

Week 8 - 07 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Load Flow Studies, Modelling and Voltage Control	Chapter 6 of Glover, Sarma, and Overbye	

Week 9 - 14 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Introduction to Transient Stability	Chapter 11 of Glover, Sarma, and Overbye	

Week 10 - 21 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Multi-machine systems, small-signal stability	Chapter 11 of Glover, Sarma, and Overbye	

Week 11 - 28 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
Stability controls, modelling of renewables	Chapters 11 and 12 of Glover, Sarma, and Overbye	

Week 12 - 05 Oct 2020

Module/Topic	Chapter	Events and Submissions/Topic
Revision		**Online test (Open book)** Due: Week 12 Monday (5 Oct 2020) 10:00 am AEST **PROJECT (GROUP SUBMISSION)** Due: Week 12 Friday (9 Oct 2020) 11:45 pm AEST

Review/Exam Week - 12 Oct 2020

Module/Topic	Chapter	Events and Submissions/Topic
		Take home exam Due: Review/Exam Week Tuesday (13 Oct 2020) 10:00 am AEST

Exam Week - 19 Oct 2020

Module/Topic	Chapter	Events and Submissions/Topic

Assessment Tasks

1 Assignment 1 (Individual Submission)

Assessment Type
Practical and Written Assessment

Task Description
Students are expected to successfully complete the exercises specified in the unit website in Moodle. This assignment may contain 3-4 problems which will require the theoretical knowledge gained through your learning during the first five weeks. The topics covered by these questions will be symmetrical components, balanced and unbalanced fault analysis, and transmission line modelling.
The marking scheme for each question will be published with the assignment and the marks for this assignment will contribute to 15% of the overall marks of this unit. Assignment questions will be published in the unit Moodle site in due course. Please also refer to the assessment criteria for more details.

Assessment Due Date
Week 6 Friday (28 Aug 2020) 11:45 pm AEST
Submit to the link in Week 6 of the unit website in Moodle as a WORD or PDF file.

Return Date to Students
Week 8 Friday (11 Sept 2020)
Feedback sheet provided through unit website in Moodle

Weighting
15%

Assessment Criteria
A total of 100 marks is allocated to this assignment. Students are assessed on the accuracy of calculated results, the correctness of the method used and presentation

Referencing Style

- Harvard (author-date)

Submission
Online

Learning Outcomes Assessed

- Discuss the difference between balanced and unbalanced operation of power systems
- Analyse, using appropriate software tools, power system performance in both balanced and unbalanced modes of operation
- Calculate fault currents and power flow in power systems and discuss the selection of appropriate protection schemes
- Investigate and report the process of updating and maintaining power network assets in order so they meet safety, reliability, availability, security, and quality requirements for both present and future society needs
- Communicate effectively using power systems terminology, symbols and diagrams adhering to Australian Standards and present design documents, solutions, and calculations professionally
- Work collaboratively and autonomously to solve problems and record and communicate clearly and professionally the approach used to solve problems.

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Ethical practice

2 Online test (Open book)

Assessment Type
Online Quiz(zes)

Task Description
This is an online test covering week 6 up to week 9 lectures.

Number of Quizzes

Frequency of Quizzes

Assessment Due Date
Week 12 Monday (5 Oct 2020) 10:00 am AEST

Return Date to Students
Review/Exam Week Friday (16 Oct 2020)
Feedback given through unit website in Moodle

Weighting
20%

Assessment Criteria
A total of 100 marks is allocated to this assignment. Students are assessed on the accuracy of calculated results and the correctness of the method used.

Referencing Style

- Harvard (author-date)

Submission
Online

Learning Outcomes Assessed

- Analyse, using appropriate software tools, power system performance in both balanced and unbalanced modes of operation
- Understand the power flow problem along with the methods of solutions and appreciate the relevance of power flow studies in power system planning and operation
- Investigate and report the process of updating and maintaining power network assets in order so they meet safety, reliability, availability, security, and quality requirements for both present and future society needs
- Explain the difference between dynamic stability and transient stability and investigate tools that could be used to analyse the power system for voltage and power angle stability performance

3 PROJECT (GROUP SUBMISSION)

Assessment Type
Written Assessment

Task Description
This assessment item will address all learning outcomes of this unit and will contribute to 30% of the final marks of the unit.
Students will be formed into teams of no more than 3 members for this assessment item.
Each team will be assigned a power system modeling and simulation exercise related to power systems stability, fault calculations, load flow etc.
The project will be based on the free edition of PowerWorld Simulator. The free edition is a version of it specifically for the use of students in university units. In this unit, you will achieve a basic competency in the use of PowerWorld Simulator. Video tutorials on the use of this software and instructions on installation are available on Moodle and Youtube.

Assessment Due Date
Week 12 Friday (9 Oct 2020) 11:45 pm AEST
Submit to the link in Week 12 of the unit website in Moodle as a WORD or PDF file with the simulation files included

Return Date to Students
Exam Week Friday (23 Oct 2020)
Feedback given through unit website in Moodle

Weighting
30%

Minimum mark or grade
The minimum mark to pass is 50% of the allocated mark for this exam.

Assessment Criteria
Objectives
This assessment item relates to ALL unit learning outcomes as stated.
Assessment Criteria
Correct procedure and steps towards constructing necessary models using modeling and simulation exercise: 60%
Correct answers and units: 30%

Professional presentation and layout of the report: 10%

Referencing Style

- Harvard (author-date)

Submission
Online Group

Submission Instructions
Submit as a pdf or Word document using the link provided on Moodle together with relevant simulation files

Learning Outcomes Assessed

- Discuss the difference between balanced and unbalanced operation of power systems
- Analyse, using appropriate software tools, power system performance in both balanced and unbalanced modes of operation
- Calculate fault currents and power flow in power systems and discuss the selection of appropriate protection schemes
- Understand the power flow problem along with the methods of solutions and appreciate the relevance of power flow studies in power system planning and operation
- Investigate and report the process of updating and maintaining power network assets in order so they meet safety, reliability, availability, security, and quality requirements for both present and future society needs
- Explain the difference between dynamic stability and transient stability and investigate tools that could be used to analyse the power system for voltage and power angle stability performance
- Communicate effectively using power systems terminology, symbols and diagrams adhering to Australian Standards and present design documents, solutions, and calculations professionally
- Work collaboratively and autonomously to solve problems and record and communicate clearly and professionally the approach used to solve problems.

Graduate Attributes

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

4 Take home exam

Assessment Type
Take Home Exam

Task Description

- The students are to solve four problems on the associated power system analysis topics covering all the lectures and tutorials.
- The exam duration will be 150min.
- The take-home exam will be monitored through a Zoom session and students will have to provide written answers to the exam questions.
- The examination will be time scheduled and will take place for everyone at the same time.
- The examination date and time will be within the standard examination period for Term 2-2020.
- Each student stays home with a device (preferably a laptop) essentially having a camera through which the student will be invigilated in a Zoom session during the examination.
- The examination paper will be loaded to Moodle.
- The student uses blank A4 papers (single side) to write answers.
- At the end of the examination, each student first takes photos of all written pages and emails invigilator.
- Later students scan the pages and upload them to Moodle within a specified time at the end of the examination.

Assessment Due Date
Review/Exam Week Tuesday (13 Oct 2020) 10:00 am AEST
Examination will be time scheduled and will take place for everyone at the same time.

Return Date to Students
Exam Week Friday (23 Oct 2020)
Feedback given through unit website in Moodle

Weighting
35%

Minimum mark or grade
The minimum mark to pass is 50% of the allocated mark for this exam.

Assessment Criteria
A total of 100 marks is allocated to this assessment. Students are assessed on the accuracy of calculated results and the correctness of the method used.

Referencing Style

- Harvard (author-date)

Submission
Online

Learning Outcomes Assessed

- Understand the power flow problem along with the methods of solutions and appreciate the relevance of power flow studies in power system planning and operation
- Investigate and report the process of updating and maintaining power network assets in order so they meet safety, reliability, availability, security, and quality requirements for both present and future society needs
- Explain the difference between dynamic stability and transient stability and investigate tools that could be used to analyse the power system for voltage and power angle stability performance
- Communicate effectively using power systems terminology, symbols and diagrams adhering to Australian Standards and present design documents, solutions, and calculations professionally
- Work collaboratively and autonomously to solve problems and record and communicate clearly and professionally the approach used to solve problems.

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