ENEE13021 *Power System Analysis and Design*
Term 1 - 2017

Profile information current as at 02/05/2024 11:15 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 that they meet safety, reliability, availability, security, and quality requirements for both present and future society needs. Distance Education (Flex) students will be required to attend a residential school to promote development of unit learning outcomes.

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 1 - 2017

- Bundaberg
- 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).

Residential Schools
This unit has a Compulsory Residential School for distance mode students and the details are:
Click here to see your Residential School Timetable.

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. **Written Assessment**
Weighting: 30%
3. **Practical and Written Assessment**
Weighting: 15%
4. **Written Assessment**
Weighting: Pass/Fail
5. **Examination**
Weighting: 40%

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 feedback.

Feedback
Video tutorials were very helpful

Recommendation
Will continue to use and enhance these where possible.

Feedback from Student feedback.

Feedback
PSSE is a difficult program to use but training videos were very useful

Recommendation
Will continue to use these and improve where necessary.

Feedback from Student feedback.

Feedback
More worked examples would be appreciated

Recommendation
Will provide these either in written or video format.

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 that 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%	•	•	•	•	•	•	•	•
2 - Written Assessment - 30%	•	•	•	•	•	•	•	•
3 - Practical and Written Assessment - 15%	•	•	•	•	•	•	•	•
4 - Examination - 40%	•	•	•	•	•	•	•	•
5 - 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 - Practical and Written Assessment - 15%	•	•	•					•		
2 - Written Assessment - 30%	•	•	•		•			•		
3 - Practical and Written Assessment - 15%	•	•	•					•		
4 - Examination - 40%		•	•					•		

Assessment Tasks	Graduate Attributes									
	1	2	3	4	5	6	7	8	9	10
5 - Written Assessment - 0%	•	•	•					•		

Textbooks and Resources

Textbooks

ENEE13021

Prescribed

Power System Analysis and Design
Sixth Edition (2012)
Authors: J. Duncan Glover, M. Sarma, T. Overbye
CEngage Learning
Boston , MA , usa
ISBN: 978-1-305-63618-7
Binding: Paperback

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
- University edition of PSSE - 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

Edward Palmer Unit Coordinator
e.palmer@cqu.edu.au

Schedule

Week 1 - 06 Mar 2017

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

Week 2 - 13 Mar 2017

Module/Topic	Chapter	Events and Submissions/Topic
Power System Modelling: An introduction	Chapters 3 & 4 of Glover,Sarma and Overbye	

Week 3 - 20 Mar 2017

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

Week 4 - 27 Mar 2017

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

Week 5 - 03 Apr 2017

Module/Topic	Chapter	Events and Submissions/Topic
Power System Network modelling,	Chapter 5 of Glover, Sarma and Overbye	

Vacation Week - 10 Apr 2017

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 17 Apr 2017

Module/Topic	Chapter	Events and Submissions/Topic
Introduction to Load Flow Analysis	Chapter 6 of Glover, Sarma, and Overbye	Assignment 1 due 23 August at 23:45 **Assignment 1 (Individual Submission)** Due: Week 6 Friday (21 Apr 2017) 11:45 pm AEST

Week 7 - 24 Apr 2017

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

Week 8 - 01 May 2017

Module/Topic	Chapter	Events and Submissions/Topic
Loadflow studies, modelling and voltage dynamics	Chapter 6 of Glover, Sarma and Overbye	

Week 9 - 08 May 2017

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

Week 10 - 15 May 2017

Module/Topic	Chapter	Events and Submissions/Topic
Multi-machine systems and small signal stability	Chapter 11 of Glover, Sarma and Overbye	Group Project due 23 September at 23:45 **Project (Group Submission)** Due: Week 10 Friday (19 May 2017) 11:45 pm AEST

Week 11 - 22 May 2017

Module/Topic	Chapter	Events and Submissions/Topic
Stability Controls, renewable generation	Chapters 11 and 12 of Glover, Sarma and Overbye	Assignment 2 due 30 September 2016 at 23:45 **Assignment 2 Individual Submission** Due: Week 11 Friday (26 May 2017) 11:45 pm AEST

Week 12 - 29 May 2017

Module/Topic	Chapter	Events and Submissions/Topic

Revision

Review/Exam Week - 05 Jun 2017

Module/Topic	Chapter	Events and Submissions/Topic
		Workbook Due: Review/Exam Week Friday (9 June 2017) 11:45 pm AEST

Exam Week - 12 Jun 2017

Module/Topic	Chapter	Events and Submissions/Topic

Term Specific Information

Video solutions of all tutorials will be provided. Students need to download a copy of PSSE Xplore, the free university edition. This is available from https://w3.usa.siemens.com/smartgrid/us/en/transmission-grid/products/grid-analysis-tools/transmission-system-planning/pages/university-order.aspx

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 contains 4 problems which will require the theoretical knowledge gained through your learning during the first five weeks. The opics covewred by these questions will be symmetrical components, balanced and unbalanced fault analysis and transmisson 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 unit Moodle site in due course. Please also refer to assessment criteria for more details.

Assessment Due Date
Week 6 Friday (21 Apr 2017) 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 (5 May 2017)
Feedback sheet provided through unit website in Moodle

Weighting
15%

Assessment Criteria
A total of 50 marks is allocated to this assignment. Students are assessed on accuracy of calculated results, 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
- 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 that 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
- Ethical practice

2 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 university edition of PSSE software. PSSE is an industry standard package used throughout Australia and overseas in power utilities. The free university 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 PSSE which will be extremely valuable should you pursue a career in the power industry. Video tutorials on the use of PSSE and instructions on installation are available on Moodle.

Assessment Due Date
Week 10 Friday (19 May 2017) 11:45 pm AEST
Submit to the link in Week 10 of the unit website in Moodle as a WORD or PDF file.

Return Date to Students
Week 12 Friday (2 June 2017)
Feedback given through unit website in Moodle

Weighting
30%

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: 20%
Professional presentation and layout of the report: 20%

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Submit as a pdf or Word doument using the link provided on Moodle.

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 that 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

3 Assignment 2 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 contains 2 problems which will require the theoretical knowledge gained through your learning during the weeks 1-8 but will focus on load flow and stability analysis. In addition they may need the usage of the university edition of PSSE to carry out simulations on practical power systems. 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 unit Moodle site in due course. Please also refer to assessment criteria for more details.

Assessment Due Date
Week 11 Friday (26 May 2017) 11:45 pm AEST
Submit to the link in Week 11 of the unit website in Moodle as a WORD or PDF file.

Return Date to Students
Review/Exam Week Friday (9 June 2017)
Feedback given through unit website in Moodle

Weighting
15%

Assessment Criteria
There are 60 marks assigned to this assignment which will consist of two questions, one on load flow analysis and one on transient stability. Marks will be assigned for accuracy of results, method used and the presentation of the results.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Submit as a pdf or Word doument using the link provided on Moodle.

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 that 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
- Ethical practice

4 Workbook

Assessment Type
Written Assessment

Task Description
The **Workbook** provides a record or detailed diary of each individual student's study and learning activities throughout the unit and should include all individual work
carried out. Preparation of a Workbook should be understood as good study technique. It also provides evidence that students have adequately studied the whole unit and
achieved unit learning outcomes.
The Workbook can be handwritten or kept as a text file. Each entry should be
dated, pages should be numbered and show your name or initials. It should be prepared week by week, not at the end of term. Show rough attempts at problems including
failures and fixes, brainstorming, draft notes and developing ideas. In the Workbook students should record:

- study notes taken while studying textbooks and unit resources
- study notes taken during lectures and/or workshops
- personal study summaries of key concepts
- notes, sketches/ drawings or mind-maps
- planning and preparation for team/project tasks
- planning and preparation for online unit discussions
- workbook practice tasks you are asked to complete in the Unit Website
- initial attempts at set tutorial tasks
- initial attempts at assignment tasks
- preparation for class tests or exams.

Assessment Due Date
Review/Exam Week Friday (9 June 2017) 11:45 pm AEST
Submit to the link provided in unit website in Moodle as a WORD or PDF file.

Return Date to Students
Exam Week Friday (16 June 2017)
Feedback given through unit website in Moodle

Weighting
Pass/Fail

Minimum mark or grade
Pass

Assessment Criteria
The students are expected to compile their workbooks according to the guidelines given in the above description. Lecturer will go through the submitted workbooks and decide the amount of work that has been compiled by each student reflects sufficient time involvement of each student into the activities of this unit and also if each student has gained sufficient understanding of the content of this unit. At the same time he will focus on assessing whether the compiled activities in workbook reflects achieving all the learning outcomes of this unit. Those students who seem to have achieved these objectives will be given a pass grade for this assessment item while the others may have to complete some supplementary assessment items specified by the lecturer.

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
- 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 that 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
- 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

Examination

Outline
Complete an invigilated examination.

Date
During the examination period at a CQUniversity examination centre.

Weighting
40%

Length
180 minutes

Exam Conditions
Closed Book.

Materials
Calculator - all non-communicable calculators, including scientific, programmable and graphics calculators are authorised
Dictionary - non-electronic, concise, direct translation only (dictionary must not contain any notes or comments).

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