ENEE20001 *Advanced Power System Analysis and Control*
Term 1 - 2018

Profile information current as at 27/04/2024 01:14 am

General Information

Overview

In this unit you will learn to work both individually and in teams in the planning, analysis and design of power systems and their associated control systems using state-of-the-art methods. You will design power systems to incorporate growing penetration of renewable energy sources. In order to do this, you will develop advanced skills to effectively design, analyse and augment power systems to maximise reliability, security and sustainability. Upon successful completion of this unit you will be able to analyse systems incorporating renewable energy sources both dynamically, and in steady state, using industry standard software. You will be able to tune control systems to satisfy Australian network standards and you will become competent to meet the challenges and opportunities of 21st century power systems as they continue to evolve. Online students are required to attend a residential school.

Details

Career Level: *Postgraduate*
Unit Level: *Level 9*
Credit Points: *12*
Student Contribution Band: *8*
Fraction of Full-Time Student Load: *0.25*

Pre-requisites or Co-requisites

ENEE14005 Capstone Power and Control Design is an Anti-Requisite for this unit
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

- Melbourne
- Perth
- 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 12-credit Postgraduate unit at CQUniversity requires an overall time commitment of an average of 25 hours of study per week, making a total of 300 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. **Online Test**
Weighting: 20%
2. **Online Test**
Weighting: 20%
3. **Portfolio**
Weighting: 60%

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.

Unit Learning Outcomes

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

1. Conduct load-flow and fault analyses of complex power systems in order to augment the system to optimise power flows and voltage profiles
2. Model advanced dynamics of complex power systems to determine transient stability limits
3. Perform dynamic stability analysis of complex power systems in order to improve power system damping
4. Model renewable power plants in steady state and transient situations to quantify their impact on system security
5. Discuss the impact of power system augmentations on economic, social, and environmental sustainability
6. Work autonomously and in teams on complex power engineering projects including providing leadership
7. Document and communicate professional engineering information, including computer-based simulations and drawings using appropriate electrical engineering standards, terminology and symbols.

Learning outcomes will be linked to Engineers Australia stage 1 competency standards 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
1 - Online Test - 20%	•						
2 - Online Test - 20%		•					
3 - Portfolio - 60%	•	•	•	•	•	•	•

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes						
	1	2	3	4	5	6	7
1 - Knowledge	∘	∘	∘	∘	∘		
2 - Communication					∘	∘	∘
3 - Cognitive, technical and creative skills	∘	∘	∘	∘	∘		
4 - Research					∘	∘	
5 - Self-management						∘	
6 - Ethical and Professional Responsibility					∘	∘	∘
7 - Leadership						∘	

Graduate Attributes	Learning Outcomes						
	1	2	3	4	5	6	7
8 - 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
1 - Online Test - 20%	○		○					
2 - Online Test - 20%	○		○					
3 - Portfolio - 60%	○	○	○	○	○	○	○	

Textbooks and Resources

Textbooks

ENEE20001

Prescribed

Power System Analysis and Design : SI Edition
Edition: 6th edn (2016)
Authors: Glover, G, Overbye, T & Sarma, M
Cengage Learning
Boston , MA , USA
ISBN: 9781305636187
Binding: Other

View textbooks at the CQUniversity Bookshop

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- MATLAB and Simulink Suite Software (For students without access to a CQUni campus), see the Textbook and Resources section for more information
- PSS/E Xplore Link for download supplied on Moodle and in project specification

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 - 05 Mar 2018

Module/Topic	Chapter	Events and Submissions/Topic
Review of power systems, models of generators, lines, loads, transformers, load flow analysis: methods, reactive compensation, reactors, capacitors, SVCs, Load flow analysis using PSS/E	Glover, Sarma and Overbye Chapter 3, sections3.1 to 3.6 Chapter 5 Chapter 6 sections 6.1-6.9	

Week 2 - 12 Mar 2018

Module/Topic	Chapter	Events and Submissions/Topic
Load flow planning studies, modelling with symmetrical components, balanced and unbalanced fault analysis, analysis of unbalanced systems, negative sequence operating limits, hand calculations	Glover, Sarma and Overbye Chapter 8 Chapter 9	

Week 3 - 19 Mar 2018

Module/Topic	Chapter	Events and Submissions/Topic
Use of PSS/E in fault calculations, - modelling and calculation methods, comparison with hand calculations.	Nil	

Week 4 - 26 Mar 2018

Module/Topic	Chapter	Events and Submissions/Topic
Introduction to power system stability, machine inertia,the swing equation. Classical machine models. Single machine infinite bus stability, equal area criterion, numerical integration of the swing equation,multi-machine systems, modelling in PSS/E	Glover, Sarma and Overbye Chapter 11, sections 11.1- 11.5	Online Test 1 **Online Test 1** Due: Week 4 Friday (30 Mar 2018) 11:45 pm AEST

Week 5 - 02 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic
Detailed machine models, exciters, and governors, modelling in PSS/E. Case Studies. Modelling of wind, solar PV, and solar Thermal.	Glover, Sarma and Overbye Chapter 11, section 11.6' Chapter 12, Sections 12.1, 12.2	

Vacation Week - 09 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 16 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic
Review of linear control theory, transfer functions, poles and zeros, open loop and closed loop systems, root locus, design of compensators using root locus, Bode plots		Online Test 2 **Online Test 2** Due: Week 6 Friday (20 Apr 2018) 11:45 pm AEST

Week 7 - 23 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic

Linear State space models, significance of eigenvalues, transfer function to state space conversions, small signal state space model of a power system. Effect of high gain exciter on damping, Power System Stabilisers.		

Week 8 - 30 Apr 2018

Module/Topic	Chapter	Events and Submissions/Topic
Effect of high gain exciter on damping, Power System Stabilisers.Tuning of exciters using root locus techniques. General review of PSS tuning methods.		

Week 9 - 07 May 2018

Module/Topic	Chapter	Events and Submissions/Topic
Review of the Australian Electricity market, the role of renewables, sustainability and the triple bottom line, issues related to high penetration of renewables.		Project Progress Report together with self and peer assessment due

Week 10 - 14 May 2018

Module/Topic	Chapter	Events and Submissions/Topic
Review of unit, requirements of portfolio submission, practice presentations, feedback on progress reports.		

Week 11 - 21 May 2018

Module/Topic	Chapter	Events and Submissions/Topic
Q&A session		Recorded Presentation due 25 May at 11:45pm

Week 12 - 28 May 2018

Module/Topic	Chapter	Events and Submissions/Topic
		Final report and self and peer assessment due
Nil		**Portfolio - Progress, report(15%), presentation(15%) and Final Report(30%)** Due: Week 12 Friday (1 June 2018) 11:45 pm AEST

Review/Exam Week - 04 Jun 2018

Module/Topic	Chapter	Events and Submissions/Topic

Exam Week - 11 Jun 2018

Module/Topic	Chapter	Events and Submissions/Topic

Term Specific Information

In this unit you will need to download PSS/E to your laptop. The link for downloading this will be available on the Moodle site and in the project specification document which will be available on Moodle before week 1. Tutorial videos on the use of PSS/E will be available on Moodle. Lectures will generally be remote by ISL and tutorials will run using Zoom. There will be some face-to-face lectures done in Melbourne.

Assessment Tasks

1 Online Test 1

Assessment Type
Online Test

Task Description
Questions on load flow and fault analysis. These will involve some hand calculations while others will be on the use of PSS/E in load flow and fault analysis.

Assessment Due Date
Week 4 Friday (30 Mar 2018) 11:45 pm AEST

Return Date to Students
Week 5 Monday (2 Apr 2018)

Weighting
20%

Minimum mark or grade
50%

Assessment Criteria
Accuracy and correctness of answers

Referencing Style

- Harvard (author-date)

Submission
Online

Learning Outcomes Assessed

- Conduct load-flow and fault analyses of complex power systems in order to augment the system to optimise power flows and voltage profiles

Graduate Attributes

- Knowledge
- Cognitive, technical and creative skills

2 Online Test 2

Assessment Type
Online Test

Task Description
Questions on transient stability analysis: the swing equation, machine inertia, classical and detailed machine models, exciters, critical clearing time, effect of renewables, use of PSS/E in transient stability analysis

Assessment Due Date
Week 6 Friday (20 Apr 2018) 11:45 pm AEST

Return Date to Students
Week 7 Monday (23 Apr 2018)

Weighting
20%

Minimum mark or grade
50%

Assessment Criteria
Accuracy and correctness of answers sypplied.

Referencing Style

- Harvard (author-date)

Submission
Online

Learning Outcomes Assessed

- Model advanced dynamics of complex power systems to determine transient stability limits

Graduate Attributes

- Knowledge
- Cognitive, technical and creative skills

3 Portfolio - Progress, report(15%), presentation(15%) and Final Report(30%)

Assessment Type
Portfolio

Task Description
The portfolio consists of a progress report, a final report and a presentation. These are group submissions however the marks will be individualised based on self and peer assessment of your contribution in the case of the reports and individual performance in the case of the presentation. The self and peer assessment is done through the university Self and Peer assessment (SPA) system. Details of this will be given on Moodle.

The due dates are as follows:
Progress report and SPA: 11:45 pm 11 May 2018,(week 9)
Recorded Presentation : 11:45pm 25 May 2018 (week 11)
Final Report and SPA: 11:45 1 June 2018 (week 12)
Weightings of these component in respect of the term totals are as follows
Progress report : 15%
Presentation : 15%
Final Report: 30%
making a total of 60% for the entire portfolio.

Assessment Due Date
Week 12 Friday (1 June 2018) 11:45 pm AEST
This is the due date for the entire portfolio. The progress report is due 11:45Pm on the Friday of week 9, the presentation the same time on the Friday of week 11 and the final report at the same time on the Friday of week 12.

Return Date to Students
Review/Exam Week Friday (8 June 2018)
Marksheets will be uploaded for individual students for each component of the portfolio, 1-2 weeks after the due date, one week in the case of the progress report so that timely feedback can be provided.

Weighting
60%

Assessment Criteria
Progress Report
1. Technical accuracy in
(a) Load flow analysis and design
(b) Fault analysis
(c) Assessment of transient stability Limits
(d) modelling of renewable plants in PSS/E
2. Working in teams as evidenced by team charter and meeting minutes, emails, and self and peer assessments
3. Statement of issues and risk assessment
4. Plan for future work and Gantt chart
5. succinctness, correct grammar, spelling and formatting

Final Report
1. Technical accuracy in the topics mentioned under progress report plus
(a) estimation of impact of renewables on system security and market operation
(b) discuss of storage needed.
(c) impact on the sustainability triple bottom line
2. Working in teams as evidenced by team charter and meeting minutes, emails, and self and peer assessments
3. Statement of issues and risk assessment
4. Recommendations
5. succinctness, correct grammar, spelling and formatting

Presentation
1. Technical aspects with respect to those mentioned under final report including sustainability and risk assessment and recommendations
2. Clarity and succinctness of slides
3. Presentation being ten minutes or less

4. Participation of all members of team and individual performance

Referencing Style

- Harvard (author-date)

Submission
No submission method provided.

Learning Outcomes Assessed

- Conduct load-flow and fault analyses of complex power systems in order to augment the system to optimise power flows and voltage profiles
- Model advanced dynamics of complex power systems to determine transient stability limits
- Perform dynamic stability analysis of complex power systems in order to improve power system damping
- Model renewable power plants in steady state and transient situations to quantify their impact on system security
- Discuss the impact of power system augmentations on economic, social, and environmental sustainability
- Work autonomously and in teams on complex power engineering projects including providing leadership
- Document and communicate professional engineering information, including computer-based simulations and drawings using appropriate electrical engineering standards, terminology and symbols.

Graduate Attributes

- Knowledge
- Communication
- Cognitive, technical and creative skills
- Research
- Self-management
- Ethical and Professional Responsibility
- Leadership

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