ENEE14005 *Capstone Power and Control Design*
Term 1 - 2019

Profile information current as at 12/10/2024 04:52 pm

All details in this unit profile for ENEE14005 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.

General Information

Overview
You will work in a team to analyse, design and prepare documentation for assigned projects using commercial software in the area of electrical power and control, with a focus on renewable energy. On satisfactory completion, you will be able to investigate solution options for an engineering problem in the area of electrical power and control, as well as, plan and control project work in a team environment, and document their professional decision-making processes; research current art of the discipline, check and evaluate validity of information, and prepare professional documentation for a project. Online students will be required to attend a residential school to promote development of unit learning outcomes.

Details
Career Level: *Undergraduate*
Unit Level: *Level 4*
Credit Points: *12*
Student Contribution Band: *8*
Fraction of Full-Time Student Load: *0.25*

Pre-requisites or Co-requisites
ENEE13021 Power System Analysis & Design (Pre-Requisite), and ENEE13019 Control Systems Analysis & Design (Pre-Requisite).
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 - 2019

- Bundaberg
- Cairns
- Gladstone
- Mackay
- Mixed Mode
- 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 12-credit Undergraduate 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.

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

Student appreciated the inclusion of solar PV in PSS/E in the unit.

Recommendation

Continue focus on renewable energy.

Feedback from Student survey

Feedback

Students feel that the unit is too much focused on Power and Control.

Recommendation

To look at Power and Control components.

Unit Learning Outcomes

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

1. Perform advanced loadflow, stability and power quality calculations using commercial software
2. Tune power system controllers to obtain desired performance
3. Adequately size and site renewable generation and storage, and design transmission infrastructure so as to provide a sustainable and reliable power supply
4. Produce a design which satisfies Australian Standards and National Electricity rules and takes into account the principles of environmental, social, and economic sustainability
5. Present a design solution in the form of a report, a presentation, and a short paper suitable for presentation at a professional engineering conference
6. Communicate, work and learn, both individually and in teams, in a professional manner.

The learning outcomes are linked to Engineers Australia Stage One Competencies.

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
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
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 - Online Test - 20%		•	•							
2 - Online Test - 20%		•	•							
3 - Portfolio - 60%	•	•	•	•	•		•	•		

Textbooks and Resources

Textbooks

ENEE14005

Supplementary

Control Systems Engineering
Edition: 7 (2014)
Authors: Norman S. Nise
Wiley
USA
ISBN: 9781118170519
Binding: Paperback
ENEE14005

Supplementary

Power System Analysis and Design
Edition: 6 (2017)
Authors: J. Duncan Glover, Thomas J. Overbye, Mulukutla Sarma
Cengage
Boston , MA , USA
ISBN: 978-1-305-63618-7
Binding: Paperback

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

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

Kianoush Emami Unit Coordinator
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Schedule

Week 1 - 11 Mar 2019

Module/Topic	Chapter	Events and Submissions/Topic
Review of Load Flow and Power System stability using classical machine models, review of PSS/E	Chapters 6, and 11 of Glover, Sarma, and Overbye	

Week 2 - 18 Mar 2019

Module/Topic	Chapter	Events and Submissions/Topic
Detailed Machine models, Simple governors and exciters, PSS/E Modelling	Section 11.6 and Chapter 12 of Glover, Sarma and Overbye	

Week 3 - 25 Mar 2019

Module/Topic	Chapter	Events and Submissions/Topic
Review of Control Theory, Small Signal Stability - Linear State space models, effect of fast exciters, Power System Stabilisers, AEMO Specifocations for damoing	Refer to ENEE13019 notes on transfer functions and linear modelling.	Online Quiz 1 **Online test 1** Due: Week 3 Friday (29 Mar 2019) 11:45 pm AEST

Week 4 - 01 Apr 2019

Module/Topic	Chapter	Events and Submissions/Topic
Review of Compensator design, modelling of voltage response of synchronous machine, exciter tuning	Refer to ENEE13019 notes on root locus design.and time domain response. See Nise chapters 4,8 and 9	

Week 5 - 08 Apr 2019

Module/Topic	Chapter	Events and Submissions/Topic
Modelling of Solar PV and Wind, effect on system performance. Effects of low system inertia, storage options	See PSS/E models document	

Vacation Week - 15 Apr 2019

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 22 Apr 2019

Module/Topic	Chapter	Events and Submissions/Topic
Transmission line design	Chapters 4 and 5, Glover, Sarma and Overbye	Project Progress Report

Week 7 - 29 Apr 2019

Module/Topic	Chapter	Events and Submissions/Topic
Transmission lines and protection	Chapter 10 Glover, Sarma and Overbye	

Week 8 - 06 May 2019

Module/Topic	Chapter	Events and Submissions/Topic
Power Quality Standards - Power Quality Issues with Renewables		

Week 9 - 13 May 2019

Module/Topic	Chapter	Events and Submissions/Topic
Allocation of Harmonic levels, Review of Electricity Market		Online Quiz 2 **Online Test 2** Due: Week 9 Friday (17 May 2019) 11:45 pm AEST

Week 10 - 20 May 2019

Module/Topic	Chapter	Events and Submissions/Topic
Review of unit and portfolio requirements		

Week 11 - 27 May 2019

Module/Topic	Chapter	Events and Submissions/Topic
Question and Answer session regarding project		

Week 12 - 03 Jun 2019

Module/Topic	Chapter	Events and Submissions/Topic
Question and Answer session regarding project		Portfolio due consisting of final report and recorded presentation. Progress report should be included as an appendix. Also self and peer assessment needs to be done as part of the final report submission. **Portfolio - Progress, report(15%), presentation(15%) and Final Report(30%)** Due: Week 12 Friday (7 June 2019) 11:45 pm AEST

Review/Exam Week - 10 Jun 2019

Module/Topic	Chapter	Events and Submissions/Topic

Exam Week - 17 Jun 2019

Module/Topic	Chapter	Events and Submissions/Topic

Term Specific Information

A minimum mark of 40% applies in each online test and a minimum score of 50% applies to the total portfolio mark.

Assessment Tasks

1 Online test 1

Assessment Type
Online Test

Task Description
Questions covering load flow analysis, reactive compensation, transmission line modelling, basic power system stability including the swing equation and critical clearing times, operation of PSS/E

Assessment Due Date
Week 3 Friday (29 Mar 2019) 11:45 pm AEST

Return Date to Students
Week 4 Monday (1 Apr 2019)

Weighting
20%

Minimum mark or grade
40% Minimum mark

Assessment Criteria
Accuracy and correctness of answers

Referencing Style

- Harvard (author-date)

Submission
Online

assessmentOutcome

- Perform advanced loadflow, stability and power quality calculations using commercial software

assessmentGradAttribute

- Problem Solving
- Critical Thinking

2 Online Test 2

Assessment Type
Online Test

Task Description
Questions on modelling of detailed synchronous machines, exciters, power system stabilisers, and renewable generation, use of PSS/E in modelling the aforementioned, power system quality

Assessment Due Date
Week 9 Friday (17 May 2019) 11:45 pm AEST

Return Date to Students
Week 10 Monday (20 May 2019)

Weighting
20%

Minimum mark or grade
40% minimum mark

Assessment Criteria
Accuracy and correctness of answers

Referencing Style

- Harvard (author-date)

Submission
Online

assessmentOutcome

- Tune power system controllers to obtain desired performance

assessmentGradAttribute

- Problem Solving
- Critical Thinking

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

Assessment Type
Portfolio

Task Description
Portfolio consists of a progress report due at 11:45 pm on the Friday of week 6, and a final report and recorded group presentation all due at 11:45pm on the Friday of week 12. Mark sheets for these tasks will be provided on Moodle. 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.
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 (7 June 2019) 11:45 pm AEST

Progress Report due 11:45PM 26 April 2019 (week 6), Final Report and recorded presentation due 11:45pm 7 June 2019 (week 12)

Return Date to Students
Exam Week Friday (21 June 2019)

Within two weeks of due date

Weighting
60%

Minimum mark or grade
50% minimum mark based on the total portfolio mark

Assessment Criteria
Progress Report
1. Technical accuracy in
(a) load flow based analysis and design
(b) detailed machine modelling including choice of H value for solar thermal
(c) modelling of exciters and PSS's and Critical clearing time calculations
(d) tuning of exciter for solar thermal
2. statement of issues and evidence of intra and inter team communication, team charter and self and peer assessments
3. plan for future work including Gantt chart
4. succinctness, correct grammar, spelling formatting etc

Final Report
1. Technical accuracy in the topics mentioned under progress report plus
(a) Estimation of harmonic issues that may arise from installation of solar plant
(b) Estimation of other power quality issues such as flicker and phase unbalance
(c) Sizing of storage.
(d) modelling of renewables in PSS/E
(e) assessment of impact of solar on system stability and discussion of mitigation measures
(f) sustainability report across triple bottom line
(g) assessment of NER clauses
(h) impact on the electricity market
2. statement of issues and evidence of intra and inter team communication, team charter and modification thereof where necessary as well as self and peer assessments
3. Risk assessment
4. succinctness, correct grammar, spelling formatting etc
5. recommendations

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
Online Group

Submission Instructions
Submit via links provided on Moodle

assessmentOutcome

- Perform advanced loadflow, stability and power quality calculations using commercial software
- Tune power system controllers to obtain desired performance
- Adequately size and site renewable generation and storage, and design transmission infrastructure so as to provide a sustainable and reliable power supply
- Produce a design which satisfies Australian Standards and National Electricity rules and takes into account the principles of environmental, social, and economic sustainability
- Present a design solution in the form of a report, a presentation, and a short paper suitable for presentation at a professional engineering conference
- Communicate, work and learn, both individually and in teams, in a professional manner.

assessmentGradAttribute

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy
- Team Work
- Cross Cultural Competence

- Ethical practice

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