



# ENEE14005 Capstone Power and Control Design

## Term 1 - 2018

Profile information current as at 03/05/2024 01:24 am

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 - 2018

- Bundaberg
- 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).

### 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 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 unit evaluations and informal class feedback

##### Feedback

Masters students did not have required background

##### Recommendation

Decouple the unit from the masters course and have a dedicated unit available for masters students which is better suited for their academic backgrounds.

#### Feedback from Observations of teaching staff and fellow students

##### Feedback

Some students, in particular the masters students, did not work on their projects until the end of term.

##### Recommendation

Add assessment items, for example quizzes, throughout the term, and certainly within the first four weeks of term.

#### Feedback from Feedback from administration staff at grade confirmation meeting.

##### Feedback

Awarding of SA grades problematic with this style of portfolio assessment with only non-numerical grades being awarded.

##### Recommendation

Assign marks to assessment items.

## 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



### Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes					
	1	2	3	4	5	6
1 - Online Test - 20%	•					

Assessment Tasks	Learning Outcomes					
	1	2	3	4	5	6
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

**There are no required textbooks.**

#### Additional Textbook Information

This course does not refer to any new textbooks, however students are required to have their recommended textbooks from previous courses as references.

### 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  
[k.emami@cqu.edu.au](mailto:k.emami@cqu.edu.au)

## Schedule

### Week 1 - 05 Mar 2018

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 - 12 Mar 2018

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 - 19 Mar 2018

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	Refer to ENEE13019 notes on transfer functions and linear modelling.	Online Quiz 1  <b>Online test 1</b> Due: Week 3 Friday (23 Mar 2018) 11:45 pm AEST

### Week 4 - 26 Mar 2018

Module/Topic	Chapter	Events and Submissions/Topic
Review of Compensator design, Exciter Tuning	Refer to ENEE13019 notes on root locus design	

**Week 5 - 02 Apr 2018**

Module/Topic	Chapter	Events and Submissions/Topic
Modelling of Solar PV and Wind, effect on system performance. Effects of low system inertia	Nil	

**Vacation Week - 09 Apr 2018**

Module/Topic	Chapter	Events and Submissions/Topic
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**Week 6 - 16 Apr 2018**

Module/Topic	Chapter	Events and Submissions/Topic
Protection against abnormal frequencies		Project Progress Report and self and peer assessment

**Week 7 - 23 Apr 2018**

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

**Week 8 - 30 Apr 2018**

Module/Topic	Chapter	Events and Submissions/Topic
Allocation of Harmonic levels, Review of Electricity Market		

**Week 9 - 07 May 2018**

Module/Topic	Chapter	Events and Submissions/Topic
Review of unit and portfolio requirements		Online Quiz 2  <b>Online Test 2</b> Due: Week 9 Friday (11 May 2018) 11:45 pm AEST

**Week 10 - 14 May 2018**

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

**Week 11 - 21 May 2018**

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

**Week 12 - 28 May 2018**

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.  <b>Portfolio - Progress, report(15%), presentation(15%) and Final Report(30%)</b> Due: Week 12 Friday (1 June 2018) 11:45 pm AEST

**Review/Exam Week - 04 Jun 2018**

Module/Topic	Chapter	Events and Submissions/Topic
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**Exam Week - 11 Jun 2018**

Module/Topic	Chapter	Events and Submissions/Topic
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## 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. Refer to project specification for deliverables. Students are expected to undertake research in the literature to find typical values of some parameters, e.g. the H constant for solar thermal plant.

## 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 (23 Mar 2018) 11:45 pm AEST

**Return Date to Students**

Week 4 Monday (26 Mar 2018)

**Weighting**

20%

**Assessment Criteria**

Accuracy and correctness of answers

**Referencing Style**

- [Harvard \(author-date\)](#)

**Submission**

Online

**Learning Outcomes Assessed**

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

**Graduate Attributes**

- 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 (11 May 2018) 11:45 pm AEST

**Return Date to Students**

Week 10 Monday (14 May 2018)

**Weighting**

20%

**Assessment Criteria**

Accuracy and correctness of answers

**Referencing Style**

- [Harvard \(author-date\)](#)

**Submission**

No submission method provided.

**Learning Outcomes Assessed**

- Tune power system controllers to obtain desired performance

**Graduate Attributes**

- 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 (1 June 2018) 11:45 pm AEST

Progress Report due 11:45 20 April 2018 (week 6), Final Report and recorded presentation due 11:45pm 4 June 2018 (week 12)

**Return Date to Students**

Exam Week Friday (15 June 2018)

Within two weeks of due date

**Weighting**

60%

**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

**Learning Outcomes Assessed**

- 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.

**Graduate Attributes**

- 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