ENEE20002 *Advanced Electrical Machines and Drives*

Term 1 - 2020

Profile information current as at 27/04/2024 06:02 am

All details in this unit profile for ENEE20002 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.

Corrections

Unit Profile Correction added on 06-05-20

With the university's decision to not hold final examinations in 2020 Term 1, an alternative assessment item to replace the examination in this unit is required. Final Examination in this unit will be temporarily changed to a take-home exam for Term 1 2020. Further information about the take home examination will be made available in the unit Moodle site. The take home examination will be designed to examine the same learning outcomes as the previously planned final examination.

General Information

Overview

The objective of this unit is to introduce you to advanced electrical machines, drives and their control. You will learn about dynamic modelling of various types of DC and AC electrical machines. The unit will also introduce you to space vector theory associated with dynamic modelling of AC electrical machines. You will also learn about DC and AC motor drives. The unit will enable you to apply vector control fundamentals in electrical machine control. You will also learn some advanced topics such as speed-sensorless control of electrical machines. You will be required to successfully complete an electrical machines and drives design team project. Online students will be required to attend a compulsory residential school in order to complete the laboratory experiments. Prior knowledge of the fundamental concepts of electrical circuit analysis and electrical power engineering is assumed.

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

ENEE14007 Electrical Machines and Drives Applications 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 - 2020

- 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).

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 Quiz(zes)**
Weighting: Pass/Fail
2. **Written Assessment**
Weighting: 10%
3. **Practical Assessment**
Weighting: 15%
4. **Portfolio**
Weighting: 30%
5. **Examination**
Weighting: 45%

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 Students survey.

Feedback
Students have appreciated the exposure to real world problems.

Recommendation
This good practice will be continued.

Feedback from Student survey.

Feedback
Students have appreciated the learning resources provided in the unit.

Recommendation
This good practice will be continued.

Feedback from Student survey.

Feedback
Students have requested detailed explanations and clarifications on complicated subject matter during the lectures. They also expect detailed feedback on their assignments.

Recommendation
Lectures and Tutorial/workshop sessions allocated for this unit will be used more effectively to better explain subject matter through application examples and simulations. Students will be provided with more detailed feedback.

Feedback from Student survey.

Feedback
Students need more clarity on assessment requirements.

Recommendation
Students will be better explained about the assessment requirements in class as well as through the unit Moodle site.

Unit Learning Outcomes

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

1. Evaluate various types of DC and AC electrical machines using dynamic modelling principles
2. Model and control AC electrical machines using space vector theory
3. Apply vector control fundamentals in advanced electrical machine control
4. Analyse and design DC and AC motor drives considering stakeholder requirements
5. Document and communicate professional engineering information, including computer-based simulations and drawings using appropriate electrical engineering standards, terminology and symbols
6. Scope, plan, manage and successfully complete engineering projects autonomously and in teams with responsible, ethical and professional attitude regarding the role of engineers.

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
1 - Online Quiz(zes) - 0%	•	•				
2 - Written Assessment - 10%	•	•		•		
3 - Practical Assessment - 15%			•	•	•	•
4 - Portfolio - 30%			•		•	•
5 - Examination - 45%	•	•	•			

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes					
	1	2	3	4	5	6
1 - Knowledge	○	○	○	○	○	○
2 - Communication				○	○	○
3 - Cognitive, technical and creative skills	○	○	○	○	○	
4 - Research		○	○	○		
5 - Self-management						○
6 - Ethical and Professional Responsibility					○	○
7 - Leadership						○
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 Quiz(zes) - 0%	○							
2 - Written Assessment - 10%	○	○	○		○			
3 - Practical Assessment - 15%	○	○	○		○	○	○	
4 - Portfolio - 30%	○	○	○	○	○	○	○	
5 - Examination - 45%	○	○	○		○	○		

Textbooks and Resources

Textbooks

ENEE20002

Supplementary

Power Electronics Circuit Devices and Applications
4th Edition (2014)
Authors: Muhammad H Rasid
USA
ISBN: 0273769081
Binding: eBook
ENEE20002

Supplementary

Power System Stability and Control
(2009)
Authors: Prabha Kundur
McGraw-Hill, Inc
USA
ISBN: 0-07-035958-x
Binding: Hardcover

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)

Referencing Style

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

Teaching Contacts

Sanath Alahakoon Unit Coordinator
s.alahakoon@cqu.edu.au

Schedule

Week 1 - 09 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
1. Basics of AC System 2. Fundamentals of Electrical Machines	Lecture Slides	

Week 2 - 16 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
Fundamentals of DC Motor	Lecture Slides	**Pre-test (online quiz)** Due: Week 2 Friday (20 Mar 2020) 11:59 pm AEST

Week 3 - 23 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
DC Motor Drives	Lecture Slides	

Week 4 - 30 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
Space Vector Theory	Lecture Slides	

Week 5 - 06 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic
Modelling of Permanent Magnet Synchronous Motor	Lecture Slides	***For mixed mode students:*** Residential school of this unit will be from 6 of April to 8 of April 2020 in Rockhampton B28/2.10.

Vacation Week - 13 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 20 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic
Modelling of Induction Motor	Lecture Slides	

Week 7 - 27 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic
Vector Control Fundamentals	Lecture Slides	**Assignment 1** Due: Week 7 Monday (27 Apr 2020) 9:00 pm AEST

Week 8 - 04 May 2020

Module/Topic	Chapter	Events and Submissions/Topic
Vector Control of Permanent Magnet Synchronous Motor	Lecture Slides	

Week 9 - 11 May 2020

Module/Topic	Chapter	Events and Submissions/Topic
Vector Control of Induction Motor	Lecture Slides	

Week 10 - 18 May 2020

Module/Topic	Chapter	Events and Submissions/Topic
Fundamentals of Power Electronic Converters	Lecture Slides	

Week 11 - 25 May 2020

Module/Topic	Chapter	Events and Submissions/Topic
Power Electronic Converters: VSC & LCC	Lecture Slides	**Laboratory/Residential School and Lab Reports** Due: Week 11 Monday (25 May 2020) 9:00 am AEST

Week 12 - 01 Jun 2020

Module/Topic	Chapter	Events and Submissions/Topic
Generation of Harmonics and Harmonic Filters	Lecture Slides	**Team Project** Due: Week 12 Monday (1 June 2020) 9:00 am AEST

Review/Exam Week - 08 Jun 2020

Module/Topic	Chapter	Events and Submissions/Topic

Exam Week - 15 Jun 2020

Module/Topic	Chapter	Events and Submissions/Topic

Term Specific Information

Students will require to use Matlab/SIMULINK for some of the assignments. Matlab/SIMULINK will be available in all student computers in the computing facilities within the university campuses. Any student wanting to use Matlab/SIMULINK off site on their personnel computers will have to purchase a student licence. The following components are strongly recommended for students purchasing student licenses:

Basic package and toolboxes

Matlab
Simulink
Communication System toolbox
Control System toolbox
DSP System toolbox
Optimization toolbox
Signal Processing toolbox
Symbolic Math toolbox
Simulink Control Design toolbox
SimScape toolbox
SimScape Power Systems toolbox

For electrical postgraduate students following toolboxes are also highly recommended.

Fuzzy Logic toolbox
Image Processing toolbox
Neural Network toolbox
System Identification toolbox
Wavelet toolbox

Assessment Tasks

1 Pre-test (online quiz)

Assessment Type
Online Quiz(zes)

Task Description
This assessment is designed to give the lecturer as well as the students a good understanding about the fundamental electrical machines knowledge of the students into this unit at the entry level. While there is no minimum pass mark for anyone to be able to continue studying the unit, the students who score lower marks in this assessment will be arranged with additional support to bring their fundamental knowledge up to speed with the expectations of this unit. The content tested will be the electrical machines fundamental knowledge students must have acquired during their undergraduate studies. The test date will be announced in advanced and will be within Week 02 of the term.

Number of Quizzes

Frequency of Quizzes

Assessment Due Date
Week 2 Friday (20 Mar 2020) 11:59 pm AEST
The test date will be announced in advanced and will be within Week 02 of the term.

Return Date to Students
Week 2 Friday (20 Mar 2020)
Students will know the test outcomes soon after completion.

Weighting
Pass/Fail

Assessment Criteria
This will be an online quiz with every question formulated as a multiple choice question. Each question will carry equal marks.

Referencing Style

- Harvard (author-date)

Submission
No submission method provided.

Learning Outcomes Assessed

- Evaluate various types of DC and AC electrical machines using dynamic modelling principles
- Model and control AC electrical machines using space vector theory

Graduate Attributes

- Knowledge

2 Assignment 1

Assessment Type
Written Assessment

Task Description
This assignment is designed to assess the learning outcomes 1, 2 and 3 of this unit. The assignment will have 4 - 8 problems associated with dynamic modelling and control of DC and AC electrical machines and modeling and control AC electrical machines using space vector theory. The students will work individually and make individual submissions.

Assessment Due Date
Week 7 Monday (27 Apr 2020) 9:00 pm AEST
Make your individual submission to the link provided in Moodle site as a PDF/WORD file

Return Date to Students
Week 9 Monday (11 May 2020)
Feedback will be provided through unit Moodle site

Weighting
10%

Minimum mark or grade
In order to pass, students must score more than 50% out of the allocated marks for this assignment.

Assessment Criteria
Each question in this assignment will be assessed separately for the criterion accuracy and correct results and given a mark as specified in the assessment that will be published in the unit Moodle site. 10% of the total marks for this assignment are based on accuracy and correct results, including:

- Correct application of maths and arithmetic
- Answers clearly identified
- Correct results

In addition, the assignment as a whole will be assessed against the following criteria:
Evidence of correct procedures (50% of the total marks for the assignment)

- All necessary steps in analysis are present on correct order
- Clear presentation of mathematical and arithmetical working linking given details of the problem to the results obtained.
- Evidence of checking results (mathematical, graphical, logic-common sense)

Evidence of understanding of the topic (30% of the total marks for the assignment)

- Explanation of choices made in the analysis (why is procedure required, why this particular procedure)
- Interpretation of results, eg limitations, direction of vectors

Professional presentation (10% of the total marks for the assignment)

- The work (job) is clearly identified (problem, date, analyst)
- Clear statement of each problem and its details and requirements
- Logical layout of analysis
- Appropriate use of diagrams, clear diagrams
- Correct use of terminology, conventions
- Clear English in the explanation of procedure and interpretation of results.
- Referencing of authoritative sources of equations and data

Referencing Style

- Harvard (author-date)

Submission
No submission method provided.

Learning Outcomes Assessed

- Evaluate various types of DC and AC electrical machines using dynamic modelling principles
- Model and control AC electrical machines using space vector theory
- Analyse and design DC and AC motor drives considering stakeholder requirements

Graduate Attributes

- Knowledge
- Communication
- Cognitive, technical and creative skills
- Self-management

3 Laboratory/Residential School and Lab Reports

Assessment Type
Practical Assessment

Task Description
This compulsory assessment item covers the laboratory experiment component of the unit. On-campus students will carry out the experiments during laboratory experiment sessions scheduled each week (attendance is compulsory) while the distance students are supposed to attend a compulsory residential school. Students will be formed into teams and each team must submit separate professional technical laboratory reports on each experiment. The details of the experiments will be notified to students through the course Website. Please also refer to assessment criteria for more details.

Assessment Due Date
Week 11 Monday (25 May 2020) 9:00 am AEST
Make your team submission to the link provided in Moodle site as a PDF/WORD file

Return Date to Students
Review/Exam Week Monday (8 June 2020)
Feedback will be provided through unit Moodle site

Weighting
15%

Minimum mark or grade
In order to pass, students must score more than 50% out of the allocated marks for this assignment.

Assessment Criteria
No Assessment Criteria

Referencing Style

- Harvard (author-date)

Submission
No submission method provided.

Learning Outcomes Assessed

- Apply vector control fundamentals in advanced electrical machine control
- Analyse and design DC and AC motor drives considering stakeholder requirements
- Document and communicate professional engineering information, including computer-based simulations and drawings using appropriate electrical engineering standards, terminology and symbols
- Scope, plan, manage and successfully complete engineering projects autonomously and in teams with responsible, ethical and professional attitude regarding the role of engineers.

Graduate Attributes

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

4 Team Project

Assessment Type
Portfolio

Task Description
This compulsory assessment item is the project component of the unit. Students will carry out this in teams. Complete details of an Electrical machines and drive system design project will be provided in unit Moodle site in the beginning of the term. Students will be carrying out the project in teams through out the term and submit a professionally done team report. The project is carried out by the teams like a team of electrical engineering consulting engineers. It requires the student teams to submit an expression of interest before a specified deadline communicated to the students through Moodle site at the early stages of the term. Afterwards, the teams are supposed to attend a debriefing meeting in the mid-way of the project execution. Final reports that must be prepared as one submission per team are expected before the deadline specified below.

Assessment Due Date
Week 12 Monday (1 June 2020) 9:00 am AEST
Make your team submission to the link provided in Moodle site as a PDF/WORD file

Return Date to Students
Exam Week Monday (15 June 2020)
Feedback will be provided through unit Moodle site

Weighting
30%

Minimum mark or grade
In order to pass, students must score more than 50% out of the allocated marks for this assignment.

Assessment Criteria
Marks for the project will be given marks out of 100 based on the quality of each project activity; i.e. Expression of interest (12%), debriefing meeting (8%), project report (70%), Peer assessment (10%). The marking schemes for each of those will be published in the Moodle site.

Referencing Style

- Harvard (author-date)

Submission
No submission method provided.

Learning Outcomes Assessed

- Apply vector control fundamentals in advanced electrical machine control
- Document and communicate professional engineering information, including computer-based simulations and drawings using appropriate electrical engineering standards, terminology and symbols
- Scope, plan, manage and successfully complete engineering projects autonomously and in teams with responsible, ethical and professional attitude regarding the role of engineers.

Graduate Attributes

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

Examination

Outline
Complete an invigilated examination.

Date
During the examination period at a CQUniversity examination centre.

Weighting
45%

Length
180 minutes

Minimum mark or grade
In order to pass, students must score more than 50% out of the allocated marks for this assignment.

Exam Conditions
Closed Book.

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

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