



ENEX12001 *Electrical Power and Machines*

Term 2 - 2023

Profile information current as at 26/04/2024 11:36 am

All details in this unit profile for ENEX12001 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

In this unit, you will model basic power system components and electrical machines using simplified linear equivalent circuits. You will explain the relationship between power and energy, and calculate power and energy in power networks and electrical machines. You will apply problem-solving techniques in the analysis of balanced three-phase power circuits using per-unit methodology. You will also investigate and compare the construction and operational characteristics of direct current (DC) and alternating current (AC) electrical machines. You will explain different drive system topologies for the electrical machines. You will explain electrical machine protection and control schemes. In this unit, you must complete compulsory practical activities. Refer to the Engineering Undergraduate Course Moodle site for proposed dates.

Details

Career Level: *Undergraduate*

Unit Level: *Level 2*

Credit Points: 6

Student Contribution Band: 8

Fraction of Full-Time Student Load: 0.125

Pre-requisites or Co-requisites

Prerequisite: (ENEG11009 Fundamentals of Energy and Electricity or PHYS11185 Engineering Physics B) AND MATH11218 Applied Mathematics.

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 2 - 2023

- Mackay
- Mixed Mode

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. **Written Assessment**

Weighting: 20%

2. **Online Quiz(zes)**

Weighting: 25%

3. **Practical and Written Assessment**

Weighting: 25%

4. **Online Test**

Weighting: 30%

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 In class student feedback

Feedback

Students appreciated the amount of support and help they have received from the unit coordinator throughout the term.

Recommendation

Maintain this good practice in future offerings.

Feedback from Unit Coordinator

Feedback

The difficulty of online quiz questions should be moderated according to the unit contents.

Recommendation

In future offerings, revisit the online quiz question bank and adjust the difficulty of the questions according to the class activities, and unit contents, especially to the tutorial workings.

Unit Learning Outcomes

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

1. Model basic power system components and machines using simplified linear equivalent circuits
2. Explain the relationship between power and energy; calculate power and energy in power networks and electrical machines
3. Compare and explain features of DC and AC electrical machines with regard to their construction and operational characteristics
4. Compare and explain features of drive systems, protection and control schemes for electric machines
5. Apply appropriate laboratory techniques and software tools to understand power systems and electrical machines
6. Create professional documentation of the solutions, designs and analysis processes using electrical terminology, diagrams and symbols that conform to Australian or International Standards
7. Work individually and collaboratively in a team to produce high-quality outputs.

The Learning Outcomes for this unit are linked with the Engineers Australia Stage 1 Competency Standards for Professional Engineers in the areas of 1. Knowledge and Skill Base, 2. Engineering Application Ability and 3. Professional and Personal Attributes at the following levels:

Introductory 1.4 Discernment of knowledge development and research directions within the engineering discipline. (LO: 1N 2N 3N 4N 5N) 1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline. (LO: 4N)

Intermediate 1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline. (LO: 1I 2I 3I 4I 5I) 1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline. (LO: 3I 4I 5I) 2.1 Application of established engineering methods to complex engineering problem solving. (LO: 1I 2I 3I 4I 5I) 3.1 Ethical conduct and professional accountability. (LO: 6I 7I) 3.2 Effective oral and written communication in professional and lay domains. (LO: 3I 4I 5I) 3.3 Creative, innovative and pro-active demeanour. (LO: 5I 6I 7I)

Advanced 1.1 Comprehensive, theory-based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline. (LO: 1A 2A 3A 4A 5A) 1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline. (LO: 1A 2A 3A 4A 5A) 2.2 Fluent application of engineering techniques, tools and resources. (LO: 2A 3A 4A 5A) 3.4 Professional use and management of information. (LO: 1A 2A 3A 4A 5A 6A) 3.5 Orderly management of self, and professional conduct. (LO: 5A 6A 7A) 3.6 Effective team membership and team leadership. (LO: 5A 6A 7A)

Note: LO refers to the Learning Outcome number(s) which link to the competency and the levels: N - Introductory, I - Intermediate and A - Advanced.

Refer to the Engineering Undergraduate Course Moodle site for further information on the Engineers Australia's Stage 1 Competency Standard for Professional Engineers and course level mapping information <https://moodle.cqu.edu.au/course/view.php?id=1511>



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	7
1 - Written Assessment - 20%	•	•				•	•
2 - Online Quiz(zes) - 25%	•	•	•	•			
3 - Practical and Written Assessment - 25%					•	•	•
4 - Online Test - 30%			•	•	•		

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes						
	1	2	3	4	5	6	7
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							

Textbooks and Resources

Textbooks

ENEX12001

Prescribed

Electrical machines, drives and power systems

6th edn - new international edition (2013)

Authors: Wildi, T

Pearson Education

Upper Saddle River , NJ , USA

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)

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

Schedule

Week 1 - 10 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
Fundamentals of Electrical Power and Machines	Scan read Chapter 1, Chapter 2 and Chapter 3 as revision.	

Week 2 - 17 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
Active, Reactive and Apparent Power	Chapter 7	

Week 3 - 24 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
Three Phase Circuits	Chapter 8	Online Quiz Part 1 opens Week 3 Monday 9:00 am AEST and closes Week 4 Monday 11:45 PM AEST.

Week 4 - 31 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
Transformers – Ideal to Practical	Chapters 9 and 10	

Week 5 - 07 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
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Special and Three Phase Transformers Chapters 11 and 12

Online Quiz Part 2 opens Week 5 Monday 9:00 am AEST and closes Week 6 Monday 11:45 PM AEST.

Vacation Week - 14 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
Week 6 - 21 Aug 2023		
Module/Topic	Chapter	Events and Submissions/Topic
DC Machines	Chapters 4 and 5	
Week 7 - 28 Aug 2023		
Module/Topic	Chapter	Events and Submissions/Topic
Three Phase Induction Machines	Chapters 13 and 15	Written Assessment Due: Week 7 Monday (28 Aug 2023) 11:45 pm AEST
Week 8 - 04 Sep 2023		
Module/Topic	Chapter	Events and Submissions/Topic
Single Phase Induction Machines	Chapter 18	Online Quiz Part 3 opens Week 8 Monday 9:00 am AEST and closes Week 9 Monday 11:45 PM AEST.
Week 9 - 11 Sep 2023		
Module/Topic	Chapter	Events and Submissions/Topic
Synchronous Machines	Chapters 16 and 17	
Week 10 - 18 Sep 2023		
Module/Topic	Chapter	Events and Submissions/Topic
Synchronous Machines	Chapters 16 and 17	Residential school of this unit is held in Week 10 from Wednesday to Friday in Mackay campus (MKY 24/G.41).
Week 11 - 25 Sep 2023		
Module/Topic	Chapter	Events and Submissions/Topic
Fundamentals of Industrial Motor Control	Chapters 20 and 21	Online Quiz Part 4 opens Week 11 Monday 9:00 am AEST and closes Week 12 Monday 11:45 PM AEST.
Week 12 - 02 Oct 2023		
Module/Topic	Chapter	Events and Submissions/Topic
Electronic Control of DC and AC Motors	Chapters 22 and 23	
Review/Exam Week - 09 Oct 2023		
Module/Topic	Chapter	Events and Submissions/Topic
		Practical and Written Assessment Due: Review/Exam Week Wednesday (11 Oct 2023) 11:45 pm AEST
Exam Week - 16 Oct 2023		
Module/Topic	Chapter	Events and Submissions/Topic
		Online Test is held during the Exam Week. The date and time of the test will be notified later in the term.

Assessment Tasks

1 Written Assessment

Assessment Type

Written Assessment

Task Description

This compulsory assessment has 6 - 8 numerical problems where students are expected to work out answers and present their working demonstrating logical steps of calculations. The questions cover the unit contents from Week 1 to Week 7. The questions of this assignment are published in the Unit Moodle website at the beginning of the term.

Assessment Due Date

Week 7 Monday (28 Aug 2023) 11:45 pm AEST

Submit to the link provided in unit Moodle site as a PDF/WORD file

Return Date to Students

Feedback will be provided within 2 weeks

Weighting

20%

Minimum mark or grade

In order to pass, students must score at least 50% 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 from zero to 100 marks. 10% of the total mark of this assignment is 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 the procedure required, why is the particular procedure required)
- Interpretation of results, e.g., 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

Online

Submission Instructions

Submit to the link provided in unit Moodle site as a PDF/WORD file

Learning Outcomes Assessed

- Model basic power system components and machines using simplified linear equivalent circuits
- Explain the relationship between power and energy; calculate power and energy in power networks and electrical machines
- Create professional documentation of the solutions, designs and analysis processes using electrical terminology, diagrams and symbols that conform to Australian or International Standards

- Work individually and collaboratively in a team to produce high-quality outputs.

2 Online Quiz(zes)

Assessment Type

Online Quiz(zes)

Task Description

The Online Quiz (with several Numerical and Multiple Choice Questions (MCQs)) is generally in the form of problems that require simple calculations to find the correct answer. Students are expected to work individually for this assessment task. To ensure continuous engagement of the students with the learning of this unit, the quiz has been separated to four parts and distributed over first 12 weeks of the term as indicated in the Unit Schedule Section. Each part of the quiz covers the unit content covered in each quarter of the term. More information on the online quizzes is provided through the unit Moodle website. Each part of the online quiz opens on the Unit Moodle Website eight clear working days prior to the respective due dates. The online quiz will randomly draw questions from a pre-designed question bank for each individual student. The quiz is a time limited assignment. More details is available for the students through the unit Moodle website. Marks of all four parts of the quiz is added and scaled to a score out of 25 to be added to the unit total.

Number of Quizzes

4

Frequency of Quizzes

Other

Assessment Due Date

Complete the online quiz by going into the links provided in Weeks 3, 5, 8 and 11.

Return Date to Students

Feedback can be accessed online when the quiz is closed.

Weighting

25%

Minimum mark or grade

In order to pass, students must score at least 50% of the allocated marks for this assessment.

Assessment Criteria

The quiz is setup as 4 parts distributed over the 12 week term as below:

Part 1 - Open during Week 3

Part 2 - Open during Week 5

Part 3 - Open during Week 8

Part 4 - Open during Week 11

Marks of all 4 parts of the quiz will be added and scaled to a score out of 25 to be added to the unit total.

Referencing Style

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

Submission

Online

Submission Instructions

Complete the online test by going into the links provided in Week 04 and Week 07.

Learning Outcomes Assessed

- Model basic power system components and machines using simplified linear equivalent circuits
- Explain the relationship between power and energy; calculate power and energy in power networks and electrical machines
- Compare and explain features of DC and AC electrical machines with regard to their construction and operational characteristics
- Compare and explain features of drive systems, protection and control schemes for electric machines

3 Practical and Written Assessment

Assessment Type

Practical and Written Assessment

Task Description

Students will be formed into teams of generally 2-3 members for this assessment item. The laboratory experiments will

be conducted in the following manner:

1. On-campus (Mackay) students and all MIX/Online students will conduct the labs in a three day intensive laboratory session (residential school).
2. Attendance in the residential school is compulsory for all students.
3. Scheduled date/time of residential school can be accessed in CQU Handbook, or Weekly Schedule Section of this Unit Profile, or Unit Moodle website.
4. All students must submit team laboratory reports for this assessment. More information on the experiments and lab sheets is made available on the unit Moodle website.

Assessment Due Date

Review/Exam Week Wednesday (11 Oct 2023) 11:45 pm AEST
Upload to the Link provided in unit Moodle site as a PDF/WORD file.

Return Date to Students

Feedback will be available in 2 Weeks.

Weighting

25%

Minimum mark or grade

In order to pass, students must score at least 50% of the allocated marks for this assessment.

Assessment Criteria

Marking of the team reports is done according to the following criteria.

- The accuracy and relevance of information
- Application of knowledge
- Language and grammar used in answering questions
- Proper referencing of sources of information
- Inclusion of all relevant Equations, images, data and tables, and the quality of presentation and layout.
- The marking scheme is published in Moodle site together with Laboratory instruction sheets.

Referencing Style

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

Submission

Online Group

Submission Instructions

Upload to the Link provided in unit Moodle site as a PDF/WORD file.

Learning Outcomes Assessed

- Apply appropriate laboratory techniques and software tools to understand power systems and electrical machines
- Create professional documentation of the solutions, designs and analysis processes using electrical terminology, diagrams and symbols that conform to Australian or International Standards
- Work individually and collaboratively in a team to produce high-quality outputs.

4 Online Test

Assessment Type

Online Test

Task Description

The Online Test is an individual assessment task conducted via the Unit Moodle website and during the University examination period. The questions will be available in Moodle during the Online Test period. The test will be open book and students can use any printed or electronic material as a reference. The questions answers should be handwritten and scanned after the test and uploaded by the given deadline. The test duration is three hours plus two additional hours for uploading and developing the answer sheet. The exam covers all contents of the unit from Week 1 to 12. Students are required to solve between 5 and 10 questions to demonstrate the theoretical knowledge they have learnt in this unit. Student must use blank A4 papers to write the answers and the final answer sheet must be submitted through the Online Test link in Moodle as a single pdf file.

In order to pass, students must score at least 50% of the allocated marks for the Take Home Exam.

Assessment Due Date

The Online Test is held during examination week. The date and time of the test will be notified later.

Return Date to Students

Feedback will be available after the grades are confirmed by the school board.

Weighting

30%

Minimum mark or grade

In order to pass, students must score at least 50% of the allocated marks for this assessment.

Assessment Criteria

Each question in the Take Home Exam will be assessed separately for the criterion accuracy and correct results and given a mark from zero to 100 marks. 10% of the total mark of this assignment is 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 the procedure required, why is the particular procedure required)
- Interpretation of results, e.g., 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

Online

Submission Instructions

Online

Learning Outcomes Assessed

- Compare and explain features of DC and AC electrical machines with regard to their construction and operational characteristics
- Compare and explain features of drive systems, protection and control schemes for electric machines
- Apply appropriate laboratory techniques and software tools to understand power systems and electrical machines

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