

## In Progress

Please note that this Unit Profile is still in progress. The content below is subject to change.



# **ENEX13002 *Power Electronics***

## **Term 2 - 2024**

Profile information current as at 19/05/2024 01:47 am

All details in this unit profile for ENEX13002 have been officially approved by CQUiversity 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 build on your electronics knowledge previously acquired. You will learn more about power semiconductor devices and their modeling, such as diodes, silicon-controlled rectifiers (SCRs), metal oxide silicon field effect transistors (MOSFETs), and isolated gate bipolar junction transistors (IGBTs), including their theory of operation and limitations. You will also learn to calculate thermal dissipation requirements of power semiconductors and to choose suitable heat sinks. You will be introduced to the concepts of alternating current (AC) to direct current (DC), AC to AC, DC to DC, and DC to AC converters. You will analyse circuits and it's waveforms using Fourier analysis. You will also review different types of motors and learn about their drives and control, including DC motor drives and AC motor drives. You will learn to design/develop power electronics solutions and test them by simulation and prototyping in the lab. 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 3*

Credit Points: 6

Student Contribution Band: 8

Fraction of Full-Time Student Load: 0.125

### Pre-requisites or Co-requisites

Prerequisites: (ENEX12002 Introductory Electronics OR ENEE13018 Analogue Electronics) AND (ENEX12001 Electrical Power and Machines OR ENEE12015 Electrical Power Engineering) ENEE12015 Electrical Power Engineering may be studied as a co-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 2 - 2024

- 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

#### 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 evaluation, email and class.

**Feedback**

The 'Useful Learning Materials' feedback item scored lower in the unit evaluation. Students have further expressed that the unit workload is high due to excess learning material for this unit.

**Recommendation**

Review learning material to eliminate peripheral or excess work.

#### Feedback from Email and class.

**Feedback**

Self-paced learning is facilitated, seeing much of the unit material is online and available from the start of the semester.

**Recommendation**

Keep this approach, especially for distance students' sake.

#### Feedback from Email, class and unit evaluation

**Feedback**

Students enjoyed the practical approach to the unit and felt that they learned a lot from the assessment tasks.

**Recommendation**

Keep developing the practical design approach as well as assessment tasks.

## Unit Learning Outcomes

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

1. Explain the construction of power semiconductor devices, their principle of operation, and their suitability for various switching functions
2. Model power electronic devices for accurate circuit analysis, including their thermal performance
3. Analyse and model the operation of single-phase and three-phase power electronic circuits, including alternating current (AC) to direct current (DC), AC to AC, DC to DC, and DC to AC topologies
4. Compare and select power electronic components, converters, and drives for electromechanical/mechatronic systems
5. Analyse and design variable speed motor drives and controllers for different types of electric motors and evaluate their performances
6. Solve real-life problems and communicate professionally using power electronics terminology
7. Work collaboratively and autonomously and communicate professionally in presenting your solutions.

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:

**Intermediate 1.1 Comprehensive, theory-based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline. (LO: 1N 2I 3I 5I ) 1.4 Discernment of knowledge development and research directions within the engineering discipline. (LO: 1N 3I 4N 5N 6I ) 2.1 Application of established engineering methods to complex engineering problem-solving. (LO: 2I 3I 5I ) 2.4 Application of systematic approaches to the conduct and management of engineering projects. (LO: 4N 6I ) 3.1 Ethical conduct and professional accountability. (LO: 2I 3I 7N ) 3.3 Creative, innovative and pro-active demeanour. (LO: 5I ) 3.5 Orderly management of self, and professional conduct. (LO: 6I ) 3.6 Effective team membership and team leadership. (LO: 1N 6I 7I )**

**Advanced 1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline. (LO: 2A 3A 5I 6I ) 1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline. (LO: 1N 2A 3A 5I 6I ) 1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline. (LO: 3I 4N 6A ) 1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline. (LO: 2A 4N 6N ) 2.2 Fluent application of engineering techniques, tools and resources. (LO: 2I 3A 6A ) 2.3 Application of systematic engineering synthesis and design processes. (LO: 2I 3I 5A ) 3.2 Effective oral and written communication in professional and lay domains. (LO: 1N 6A 7I ) 3.4 Professional use and management of information. (LO: 1N 4N 6A )**

**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 - Written Assessment - 20%			•		•	•	
3 - Practical and Written Assessment - 20%	•			•		•	•
4 - Online Test - 40%		•	•		•		

### 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

Information for Textbooks and Resources has not been released yet.

This information will be available on Monday 17 June 2024

## Academic Integrity Statement

Information for Academic Integrity Statement has not been released yet.

This unit profile has not yet been finalised.