



# ENAE12013 *Electrical Components and Circuit Analysis*

## Term 1 - 2022

Profile information current as at 03/05/2024 03:12 pm

All details in this unit profile for ENAE12013 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

This unit introduces you to modelling electrical components and systems. You will apply theorems and network reduction techniques to DC and AC circuits, and apply problem-solving techniques in the analysis of AC and DC circuits. You will also cover the concepts of transient response, and Laplace transform and transfer functions. You will apply laboratory techniques and appropriate software tools to the analysis of electrical circuits. Use fundamental electrical engineering language in context and document the process of modelling and analysis. You will present information, communicate, work and learn in a professional manner. Mix mode students must complete the practical activities by attending residential school.

### 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

Prereq: (ENAG11002 Energy & Electricity or ENEG11009 Fundamentals of Energy & Electricity) and MATH11160 Technology 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 1 - 2022

- 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. **In-class Test(s)**

Weighting: 25%

#### 2. **Online Quiz(zes)**

Weighting: 10%

#### 3. **Practical Assessment**

Weighting: 25%

#### 4. **Examination**

Weighting: 40%

### 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 evaluation

**Feedback**

The subject involved advanced mathematics.

**Recommendation**

Try to teach advanced mathematics in a simple and easy to understand way using scaffolding techniques.

#### Feedback from Forum posts

**Feedback**

Turnaround time for answering questions was appreciated.

**Recommendation**

Maintain similar practice.

#### Feedback from In-class

**Feedback**

Students were appreciative for providing individual attention, keeping frequent engagement, providing the tutorial solutions with appropriate scaffolding.

**Recommendation**

Maintain the same practice.

## Unit Learning Outcomes

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

1. Solve electrical circuits using fundamental electrical theorems
2. Analyse and solve problems of Direct Current (DC) circuits using network reduction techniques
3. Model and analyse the transient behaviour of circuits with resistors, inductors and capacitors
4. Analyse and solve problems of Alternating Current (AC) circuits
5. Solve electrical circuit problems using S-domain circuit analysis techniques
6. Use appropriate software tools to simulate electrical circuits and verify the results by conducting laboratory experiments using safe work practices
7. Work individually and in a team to solve electrical circuit problems and produce professional laboratory documents.

**The Learning Outcomes for this unit are linked with the Engineers Australia Stage 1 Competency Standards for Engineering Associates 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 Descriptive, formula-based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the practice area. (LO: 1I 2I 3I 4I)**

**1.3 In-depth practical knowledge and skills within specialist sub-disciplines of the practice area. (LO: 7I)**

**1.4 Discernment of engineering developments within the practice area. (LO: 1I 7I)**

**2.1 Application of established technical and practical methods to the solution of well-defined engineering problems. (LO: 1I 2I 3I 4I 5I 6I)**

**2.3 Application of systematic design processes to well-defined engineering problems. (LO: 6I)**

**3.2 Effective oral and written communication in professional and lay domains. (LO: 7I)**

**3.4 Professional use and management of information. (LO: 7I)**

**3.6 Effective team membership and team leadership. (LO: 7I)**

### Advanced

**1.2 Procedural-level understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the practice area. (LO: 2A 3A 4A 5A 6I)**

**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

|   |  |  |  |  |  |
|---|--|--|--|--|--|
|  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 | 7 |
| 1 - In-class Test(s) - 25%     | •                 | • | • |   |   |   |   |
| 2 - Online Quiz(zes) - 10%     | •                 | • |   | • | • |   |   |
| 3 - Practical Assessment - 25% |                   |   |   |   |   | • | • |
| 4 - Examination - 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

### Textbooks

ENAE12013

#### **Prescribed**

#### **COMPKIT\_ENAE12013**

Edition: 1 (2021)

CQU-SET

Binding: Other

ENAE12013

#### **Prescribed**

#### **Introductory Circuit Analysis**

13th (GLOBAL Edition) (2016)

Authors: Boylestad, RL

Pearson

Upper Saddle River , NJ , USA

ISBN: 9781292098951

Binding: Paperback

ENAE12013

#### **Prescribed**

#### **TAMKIT**

Edition: 1 (2021)

CQU-SET

Binding: Other

ENAE12013

#### **Prescribed**

#### **TAMKITU**

Edition: 1 (2021)

CQU-SET

Binding: Other

[View textbooks at the CQUniversity Bookshop](#)

### IT Resources

**You will need access to the following IT resources:**

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- Multisim 14.0 Education Edition or later (CQU will provide the licence key to install it on student computers).

## Referencing Style

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

## Teaching Contacts

**Shaminda De Silva** Unit Coordinator  
[s.desilva@cqu.edu.au](mailto:s.desilva@cqu.edu.au)

## Schedule

**Week 1 - 07 Mar 2022**

| Module/Topic   | Chapter | Events and Submissions/Topic |
|--|---------|------------------------------|
| Electrical Components and Modelling their Electrical Characteristics | 1-7     |                              |

**Week 2 - 14 Mar 2022**

| Module/Topic   | Chapter | Events and Submissions/Topic  |
|----------------|---------|---|
| Nodal Analysis | 8       | <b>Online Quiz 1 :</b> (Progressive Test 1): Due Sunday 11:45 pm AEST |

**Week 3 - 21 Mar 2022**

| Module/Topic  | Chapter | Events and Submissions/Topic                |
|---------------|---------|---|
| Mesh Analysis | 8       | <b>Lab Quiz 1:</b> Due Sunday 11:45 pm AEST |

**Week 4 - 28 Mar 2022**

| Module/Topic     | Chapter | Events and Submissions/Topic  |
|------------------|---------|---|
| Network Theorems | 9       | <b>Online Quiz 2:</b> (Progressive Test 2): Due Sunday 11:45pm AEST |

**Week 5 - 04 Apr 2022**

| Module/Topic             | Chapter | Events and Submissions/Topic                 |
|--------------------------|---------|--|
| Capacitors and Inductors | 10-12   | <b>Lab Quiz 2 :</b> Due Sunday 11:45 pm AEST |

**Vacation Week - 11 Apr 2022**

| Module/Topic | Chapter | Events and Submissions/Topic |
|--------------|---------|------------------------------|
|--------------|---------|------------------------------|

**Week 6 - 18 Apr 2022**

| Module/Topic                                 | Chapter | Events and Submissions/Topic  |
|--|---------|---|
| Transient Behaviour of Electrical Components | 10-12   | <b>In-class test</b> (Online) <b>starts at 8:30 am (AEST)</b> on <b>Wednesday</b> (20 Apr 2022)<br><br><b>In-class test</b> Due: Week 6 Wednesday (20 Apr 2022) 11:45 am AEST |

**Week 7 - 25 Apr 2022**

| Module/Topic                | Chapter | Events and Submissions/Topic  |
|-----------------------------|---------|---|
| Complex Numbers and Phasors | 13-14   | <b>Online Quiz 3:</b> (Progressive Test 3) : Due Sunday 11:45 pm AEST |

**Week 8 - 02 May 2022**

| Module/Topic                       | Chapter | Events and Submissions/Topic                |
|------------------------------------|---------|---|
| Steady State Sinusoidal Analysis I | 15-17   | <b>Lab Quiz 3:</b> Due Sunday 11:45 pm AEST |

**Week 9 - 09 May 2022**

| Module/Topic                        | Chapter | Events and Submissions/Topic                 |
|-------------------------------------|---------|--|
| Steady State Sinusoidal Analysis II | 17-19   | <b>Lab Quiz 4 :</b> Due Sunday 11:45 pm AEST |

**Week 10 - 16 May 2022**

| Module/Topic         | Chapter | Events and Submissions/Topic   |
|----------------------|---------|--|
| Power in AC circuits | 20      | <b>Online Quiz 4 :</b> (Progressive Test 4) Due Sunday 11:45 pm AEST |

**Week 11 - 23 May 2022**

| Module/Topic | Chapter | Events and Submissions/Topic |
|--------------|---------|------------------------------|
|--------------|---------|------------------------------|

**Week 12 - 30 May 2022**

| Module/Topic                 | Chapter              | Events and Submissions/Topic |
|------------------------------|----------------------|------------------------------|
| Circuit Analysis in s Domain | Unit Resource Online |                              |

**Review/Exam Week - 06 Jun 2022**

| Module/Topic | Chapter | Events and Submissions/Topic |
|--------------|---------|------------------------------|
| Review       | All     |                              |

**Exam Week - 13 Jun 2022**

| Module/Topic | Chapter | Events and Submissions/Topic |
|--------------|---------|------------------------------|
|--------------|---------|------------------------------|

## Term Specific Information

TAMKIT1 or TAMKITU1, which has following items required to complete the labs of this unit from home.

- 1 12VAC Plug Pack Power Supply
- 1 3D Printed Component Box
- 4 4mm Banana Plug to Test Hook Clip Test Lead Cable
- 1 BNC Male Plug Q9 to Dual Hook Clip Test Probe Cable Leads (2 leads will come with scope)
- 1 Breadboard
- 1 A3 Box for Australia Post Tough Bag
- 1 Multimeter - True RMS, with Leads
- 1 Power Supply - 12VAC / 5VDC and -15V/0/15V
- 1 USB Cable for Oscilloscope (included with Pico Scope)
- 1 USB Oscilloscope (Pico will include two leads)

## Assessment Tasks

### 1 In-class test

**Assessment Type**

In-class Test(s)

**Task Description**

This assessment covers weekly topics from Week 1 to Week 5. Students are required to answer analytical and numerical questions to demonstrate their theoretical knowledge and analytical problem solving skills.

Students will attend in-class test **during Week 6.**

This **in-class test** will be carried out as **an Online Quiz** through the unit **Moodle** site.

Further information about In-class test will be provided in the unit Moodle site.

**Assessment Due Date**

Week 6 Wednesday (20 Apr 2022) 11:45 am AEST

Suggested date and time will be confirmed and notified via the unit Moodle site

**Return Date to Students**

Week 8 Wednesday (4 May 2022)

We strive to release the assessment marks in 2 weeks after due date

**Weighting**

25%

**Minimum mark or grade**

25% of allocated marks for this assessment

**Assessment Criteria**

In-class test will be graded using the following criteria:

- Correct answers
- All working must be shown
- Answers must be neat, tidy and legible



- Correct format
- Application of correct methods and procedures
- Discussion of answers
- All questions must be attempted
- Each question in the test will be assessed separately.
- Need to score more than 25% to PASS

### Referencing Style

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

### Submission

Online

### Learning Outcomes Assessed

- Solve electrical circuits using fundamental electrical theorems
- Analyse and solve problems of Direct Current (DC) circuits using network reduction techniques
- Model and analyse the transient behaviour of circuits with resistors, inductors and capacitors

### Graduate Attributes

- Problem Solving
- Critical Thinking

## 2 Online Quizzes (Progressive Tests)

### Assessment Type

Online Quiz(zes)

### Task Description

The assessment is a set of online Progressive tests which can be accessed via the unit Moodle site. The progressive tests are an integrated part of the study to test on the key concepts of each week. Details of the assessment can be found on the unit Moodle site at the beginning of the term. Each Progressive test will be available up to 2 weeks after the relevant week to allow students who cannot find time each week for study. For example Progressive test one will close at the end of week 2 and Progressive test 2 will close at end of week 5. All progressive tests must be completed by the end of week 10.

Each progressive test can be attempted several times, but the score for the Progressive test will be score for your first attempt. Correct answer for the Progressive test questions will be available immediately after you submit your answers. If you encounter any network access issues during the Progressive test, the unit coordinator should be notified at your earliest convenient.

### Number of Quizzes

4

### Frequency of Quizzes

### Assessment Due Date

Suggested date and time will be notified and confirmed via the unit Moodle site

### Return Date to Students

Results are available immediately after completion of each Progressive test

### Weighting

10%

### Minimum mark or grade

50% of allocated marks for this assessment

### Assessment Criteria

Students must need to satisfactorily score more than 50% for the Online quizzes (Progressive test) to pass this unit.

### Referencing Style

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

### Submission

Online

### Learning Outcomes Assessed

- Solve electrical circuits using fundamental electrical theorems
- Analyse and solve problems of Direct Current (DC) circuits using network reduction techniques
- Analyse and solve problems of Alternating Current (AC) circuits
- Solve electrical circuit problems using S-domain circuit analysis techniques

### Graduate Attributes

- Problem Solving
- Critical Thinking

## 3 Practical and written assessment

### Assessment Type

Practical Assessment

### Task Description

This assessment item covers all topics.

All students **must pass** the laboratory exercise based assessment in order to pass the unit.

Students need to answer a set of online quizzes and submit laboratory exercise reports to complete this assessment task.

Students will be offered number of options to complete laboratory exercises at home or by physically attending one of our campuses. Please refer to the unit Moodle site for further information.

Each student must **submit an individual laboratory report** (not one report per laboratory group) by the due date although some students might be working in teams during the laboratory sessions in campuses.

Additional information regarding the laboratories will be provided to the students via the unit Moodle site at the start of the term progressively.

### Assessment Due Date

Practical and written assessment Due: Week 11 Monday 7:00 am AEST

### Return Date to Students

We strive to release the assessment marks in 2 weeks after due date

### Weighting

25%

### Minimum mark or grade

50% of allocated marks for this assessment

### Assessment Criteria

Laboratory exercises will be graded using the following criteria,

- Correct answers
- All working must be shown
- Report must be neat, tidy and legible
- Correct format
- Correct description of laboratory procedures
- Correct interpretation and discussion of laboratory results
- All laboratory exercises must be attempted
- Laboratory exercise based assessment marks need to be more than 50% to PASS

### Referencing Style

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

### Submission

Online

### Learning Outcomes Assessed

- Use appropriate software tools to simulate electrical circuits and verify the results by conducting laboratory experiments using safe work practices
- Work individually and in a team to solve electrical circuit problems and produce professional laboratory documents.

**Graduate Attributes**

- Communication
- Problem Solving
- Critical Thinking
- Information Technology Competence

## Examination

**Outline**

Complete an invigilated examination.

**Date**

During the examination period at a CQUniversity examination centre.

**Weighting**

40%

**Length**

180 minutes

**Minimum mark or grade**

50% of allocated marks for this examination

**Exam Conditions**

Restricted.

**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