



# ENEC13016 Concrete Technology and Design

## Term 2 - 2023

Profile information current as at 07/05/2024 08:01 am

All details in this unit profile for ENEC13016 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 the design of concrete structures, including structural components such as beams, slabs, columns, footings and retaining walls. You will identify loads and load paths for gravity and lateral loading. Construction materials are also reviewed in the context of sustainability and environmental issues. You will also plan, prepare and carry out tests on structural concrete components, interpret the results and prepare test reports. You will investigate building design and serviceability requirements. Individual and teamwork focus on the development of professionalism, ethical practice, problem solving and communication. 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: ENEC12012 Stress Analysis 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

- Bundaberg
- Cairns
- 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 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: 10%

#### 2. **Laboratory/Practical**

Weighting: 20%

#### 3. **Project (applied)**

Weighting: 30%

#### 4. **Online Test**

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 Evaluations

**Feedback**

The unit was interactive and the lecturer made great efforts to support our learning - overall well-delivered unit.

**Recommendation**

This practice should continue in future offerings as well.

#### Feedback from Student Evaluations and Self-reflection

**Feedback**

Some detailed feedback can be added to the team projects.

**Recommendation**

This should be taken into consideration in the 2023 offer.

## Unit Learning Outcomes

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

1. Explain how the key material properties of reinforced concrete affect the structural performance
2. Explain the ultimate and serviceability design limit states for reinforced concrete members
3. Design reinforced concrete members subjected to various design actions according to Australian Standard AS3600
4. Interpret the result of conducting laboratory tests on the properties of concrete
5. Demonstrate a professional level of communication and teamwork.

**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 3.1 Ethical conduct and professional accountability. (LO: 3N ) 3.5 Orderly management of self, and professional conduct. (LO: 5N )**

**Intermediate 1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline. (LO: 3I 4N ) 3.2 Effective oral and written communication in professional and lay domains. (LO: 5I ) 3.3 Creative, innovative and pro-active demeanour. (LO: 3I ) 3.4 Professional use and management of information. (LO: 1N 3I 4I ) 3.6 Effective team membership and team leadership. (LO: 3I 4I 5I )**

**Advanced 1.1 Comprehensive, theory-based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline. (LO: 1I 2I 3A 4I ) 1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline. (LO: 1A 2I 3A 4A ) 1.4 Discernment of knowledge development and research directions within the engineering discipline. (LO: 1I 2I 3A 4I ) 1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline. (LO: 1I 2I 3A 4N ) 1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline. (LO: 1A 3A ) 2.1 Application of established engineering methods to complex engineering problem-solving. (LO: 3A ) 2.2 Fluent application of engineering techniques, tools and resources. (LO: 3A 4I ) 2.3 Application of systematic engineering synthesis and design processes. (LO: 1I 3A 4N )**

**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
<b>1 - Written Assessment - 10%</b>	•		•		

Assessment Tasks	Learning Outcomes				
	1	2	3	4	5
2 - Laboratory/Practical - 20%				•	•
3 - Project (applied) - 30%		•	•		•
4 - Online Test - 40%	•	•	•		

## Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes				
	1	2	3	4	5
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 - Written Assessment - 10%	•	•	•	•						
2 - Laboratory/Practical - 20%	•	•			•					
3 - Project (applied) - 30%	•	•	•	•	•		•			
4 - Online Test - 40%	•	•	•	•						

## Textbooks and Resources

### Textbooks

ENEC13016

#### Prescribed

##### Reinforced Concrete Basics

3rd Edition (2021)

Authors: Stephen Foster, Andrew Kilpatrick and Robert Warner

Pearson Original Australia

Australia

ISBN: 9780655703679

Binding: eBook

[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

**Kumaran Suntharavadivel** Unit Coordinator

[t.suntharavadivel@cqu.edu.au](mailto:t.suntharavadivel@cqu.edu.au)

## Schedule

### Week 1 - 10 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
Concrete Technology <ul style="list-style-type: none"><li>• Cement, Aggregates</li><li>• Concrete Mix Design</li><li>• Curing Process</li></ul>		

### Week 2 - 17 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
Concrete Constructions <ul style="list-style-type: none"><li>• Handling and Placing concrete</li><li>• Testing of Concrete</li></ul>		

### Week 3 - 24 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
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Introduction of RC Design	Chapters 1 and 2
• Limit State Design and Load Combinations	
• Design Properties of Concrete and Reinforcement	
• Durability and Fire Resistance Requirements	
• Structural Analysis as per AS3600	

#### Week 4 - 31 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
Design of RC Beam I	Chapter 3	
• Analysis and design for Serviceability Limit State requirements		

#### Week 5 - 07 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
Design of RC Beam II	Chapter 3	
• Analysis and design for Ultimate Limit State requirements (Flexural strength, Shear and Torsion) for Rectangular beam		

#### Vacation Week - 14 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
Mid-Term Break		

#### Week 6 - 21 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
Design of RC Beam III	Chapter 3	Laboratory Session in GLD & MKY campuses (Monday - Wednesday)
• Design of T-Beams and irregular shapes		

#### Week 7 - 28 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
Design of RC Slab I	Chapter 4	Laboratory Session in ROK, BDG & CRN campuses (Monday - Wednesday)
• Slabs Supported by Beams/Walls [One-way and Two-way slab system]		<b>Assignment 1</b> Due: Week 7 Tuesday (29 Aug 2023) 5:00 pm AEST

#### Week 8 - 04 Sep 2023

Module/Topic	Chapter	Events and Submissions/Topic
Design of RC Slabs II	Chapter 4	
• Slabs supported by columns [Flat Slabs]		
• Beam-slab system		

#### Week 9 - 11 Sep 2023

Module/Topic	Chapter	Events and Submissions/Topic
Design of Columns I	Chapter 5	<b>Practical Report</b> Due: Week 9 Wednesday (13 Sep 2023) 5:00 pm AEST
• The load capacity of rectangular columns		

#### Week 10 - 18 Sep 2023

Module/Topic	Chapter	Events and Submissions/Topic
Design of Columns II	Chapter 5	
• Design of longitudinal and shear reinforcements for columns		

#### Week 11 - 25 Sep 2023

Module/Topic	Chapter	Events and Submissions/Topic
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Introduction to Advanced Topics  
• Design considerations for Walls and Footings  
• Beam Design using Strut-and-tie Modelling

Chapter 6 & 7

**Team Project** Due: Week 11  
Wednesday (27 Sept 2023) 5:00 pm AEST

#### Week 12 - 02 Oct 2023

Module/Topic	Chapter	Events and Submissions/Topic
Revision		

#### Review/Exam Week - 09 Oct 2023

Module/Topic	Chapter	Events and Submissions/Topic
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#### Exam Week - 16 Oct 2023

Module/Topic	Chapter	Events and Submissions/Topic
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**End-of-term Test** Due: Exam Week  
Wednesday (18 Oct 2023) 12:00 pm AEST

## Assessment Tasks

### 1 Assignment 1

#### Assessment Type

Written Assessment

#### Task Description

This assignment aims to allow the students to demonstrate their understanding of basic concepts, theories, and processes related to reinforced concrete design studied/developed in this unit. Contents covered until Week 6 included in this assessment.

Assignment 1 will be available on Monday Week 2.

#### Assessment Due Date

Week 7 Tuesday (29 Aug 2023) 5:00 pm AEST

#### Return Date to Students

Week 9 Wednesday (13 Sept 2023)

#### Weighting

10%

#### Assessment Criteria

**Each question will be assessed for criterion accuracy and correct answers.**

- Correct application of mathematics and arithmetic
- Answers clearly identified and explained
- Correct results/explanation

#### Referencing Style

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

#### Submission

Online

#### Submission Instructions

One Single file (PDF is preferred)

#### Learning Outcomes Assessed

- Explain how the key material properties of reinforced concrete affect the structural performance
- Design reinforced concrete members subjected to various design actions according to Australian Standard AS3600



### **Graduate Attributes**

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy

## **2 Practical Report**

### **Assessment Type**

Laboratory/Practical

### **Task Description**

Students will work on various practical activities associated with concrete design that includes

- characterise the materials and determine required quantities of cement, water and aggregates for a given concrete grade
- plan and prepare concrete samples for laboratory tests according to Australian Standards
- test the samples to determine both fresh and hardened properties of concrete.
- explain the different NDT techniques used in the concrete industry.

### **Assessment Due Date**

Week 9 Wednesday (13 Sept 2023) 5:00 pm AEST

### **Return Date to Students**

### **Weighting**

20%

### **Minimum mark or grade**

50%

### **Assessment Criteria**

**Each question will be assessed for criterion accuracy and correct answers.**

- Correct application of mathematics and arithmetic
- Answers clearly identified and explained
- Correct results/explanation

**In addition, the student's participation in the practical class also will be considered in the final marks.**

### **Referencing Style**

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

### **Submission**

Online

### **Submission Instructions**

Two files (Report as PDF and Concrete mix design in Excel format)

### **Learning Outcomes Assessed**

- Interpret the result of conducting laboratory tests on the properties of concrete
- Demonstrate a professional level of communication and teamwork.

### **Graduate Attributes**

- Communication
- Problem Solving
- Team Work

## **3 Team Project**

### **Assessment Type**

Project (applied)

### **Task Description**

Students will be worked as a team to design an RC structure (main structural elements such as Slab, Beam and Column) as per the stakeholders' requirements. Detail of this project will be available on Friday, Week 5

**Assessment Due Date**

Week 11 Wednesday (27 Sept 2023) 5:00 pm AEST

**Return Date to Students**

Review/Exam Week Wednesday (11 Oct 2023)

**Weighting**

30%

**Minimum mark or grade**

50%

**Assessment Criteria**

**Each question will be assessed for criterion accuracy and correct answers.**

- Correct application of mathematics and arithmetic
- Answers clearly identified and explained
- Correct results/explanation

**In addition, the student's contribution in the team work also will be considered in the final marks.**

**Referencing Style**

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

**Submission**

Online Group

**Learning Outcomes Assessed**

- Explain the ultimate and serviceability design limit states for reinforced concrete members
- Design reinforced concrete members subjected to various design actions according to Australian Standard AS3600
- Demonstrate a professional level of communication and teamwork.

**Graduate Attributes**

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy
- Team Work
- Cross Cultural Competence

## 4 End-of-term Test

**Assessment Type**

Online Test

**Task Description**

End-of-Term Examination will be conducted in the form of an online test during examination week.

Important: Students need to complete this test at the **prescribed time as specified below**. It is expected the student should be on their web camera for invigilation during the test.

Students should submit their workings at the conclusion of the examination (Scanned copy).

Exam Date and time: 18th October 2023 at 09:00 AM (QLD time)

Duration of the Test: 3 hours

The scanned copy of the solutions should be uploaded within or before 12:30 PM on 18th October 2023. No late submissions will be accepted.

**Assessment Due Date**

Exam Week Wednesday (18 Oct 2023) 12:00 pm AEST

Submission link will close at 12:30 PM. Single file (word or pdf) submission.

**Return Date to Students**

On the Certification of Grade day

**Weighting**

40%

**Minimum mark or grade**

50%

**Assessment Criteria**

**Each question will be assessed for criterion accuracy and correct answers.**

- Correct application of mathematics and arithmetic
- Answers clearly identified and explained
- Correct results/explanation

**Referencing Style**

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

**Submission**

Online

**Learning Outcomes Assessed**

- Explain how the key material properties of reinforced concrete affect the structural performance
- Explain the ultimate and serviceability design limit states for reinforced concrete members
- Design reinforced concrete members subjected to various design actions according to Australian Standard AS3600

**Graduate Attributes**

- Communication
- Problem Solving
- Critical Thinking
- Information Literacy

## 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