



# ENMM20028 *Reliability, Availability, Maintainability and Safety*

## Term 2 - 2023

Profile information current as at 05/05/2024 03:39 pm

All details in this unit profile for ENMM20028 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 the key concepts involved in the reliability, availability, maintainability and safety of fixed and mobile plants and equipment. Through this unit, students will develop skills to analyse faults and failure data related to maintenance activities to achieve high plant integrity.

### Details

Career Level: *Postgraduate*

Unit Level: *Level 8*

Credit Points: 6

Student Contribution Band: 8

Fraction of Full-Time Student Load: 0.125

### Pre-requisites or Co-requisites

Prerequisites: ENMM20023 and ENMM20025

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

- Online

### 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 6-credit Postgraduate 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: 40%

#### 2. **Online Test**

Weighting: 20%

#### 3. **Written Assessment**

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 Have Your Say

**Feedback**

The unit contents are aligned to real life practices. Use of the AWB software was very useful at the workplace.

**Recommendation**

These elements of the delivery and practice with software will be restored.

#### Feedback from Have Your Say

**Feedback**

Lecturer and tutor delivered the contents very efficiently and effectively.

**Recommendation**

The lecturer and tutor both will be encouraged to maintain their reputation by delivering unit contents effectively.

#### Feedback from Have Your Say

**Feedback**

The lecturer has an in-depth knowledge of the subject, but he focussed more on the usage of the software as compared to theory.

**Recommendation**

The lecturer will be advised to align theory and its application using the AWB software by reducing the gap in lecture and software practice sessions.

#### Feedback from Have Your Say

**Feedback**

The moodle navigation needs an improvement.

**Recommendation**

The Moodle website will be reviewed, changes will be made where necessary and the teaching team will be asked to help students in the class if they have difficulty in accessing any information.

## Unit Learning Outcomes

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

1. Identify factors influencing the reliability and maintainability in plant operations.
2. Investigate operational safety and plant integrity in plant operations.
3. Apply reliability concepts, tools and techniques to achieve plant integrity.
4. Develop a safety and risk plan in a maintenance organisation.

n/a

## 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 |
| 1 - Written Assessment - 40% | •                 | • | • |   |
| 2 - Online Test - 20%        |                   | • | • | • |
| 3 - Written Assessment - 40% | •                 |   |   | • |

### Alignment of Graduate Attributes to Learning Outcomes

| Graduate Attributes                                | Learning Outcomes |   |   |   |
|--|-------------------|---|---|---|
|  | 1                 | 2 | 3 | 4 |
| 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 |                   |   |   |   |

## Textbooks and Resources

### Textbooks

There are no required textbooks.

### 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

**Arash Daemi** Unit Coordinator  
[a.daemi@cqu.edu.au](mailto:a.daemi@cqu.edu.au)

## Schedule

### Week 1 - 10 Jul 2023

| Module/Topic  | Chapter                             | Events and Submissions/Topic   |
|---|-------------------------------------|--|
| Module 1 – Introduction to Reliability, Availability, Maintainability & Safety (RAMS) | Module 1: Read Sections 1.1 to 1.24 | Online lectures and tutorials are scheduled via Zoom sessions. Details are provided on the Moodle website for this unit. Please attend the first Zoom session this week and have an overview of the unit, including requirements for attempting assignments.<br>Lecture: Introduction to Reliability, Availability, Maintainability & Safety (RAMS)<br>Tutorial: Exercises on RAMS |

### Week 2 - 17 Jul 2023

| Module/Topic   | Chapter                            | Events and Submissions/Topic   |
|--|------------------------------------|--|
| Module 2– Root Cause Analysis (RCA), Fault Tree Analysis (FTA) & Event Tree Analysis (ETA) | Module 2: Read Sections 2.1 to 2.3 | Lecture: Introduction to RCA, FTA & ETA<br>Tutorial: Exercises on RCA, FTA & ETA |

### Week 3 - 24 Jul 2023

| Module/Topic  | Chapter                     | Events and Submissions/Topic                                |
|---|-----------------------------|---|
| Module 3 – Root Cause Analysis (RCA) in the Workplace | Module 3 – Read Section 3.1 | Lecture: RCA in the Workplace<br>Tutorial: Exercises on RCA |

### Week 4 - 31 Jul 2023

| Module/Topic                               | Chapter                           | Events and Submissions/Topic  |
|--|-----------------------------------|---|
| Module 4 – Failure Data & Weibull Analysis | Module 4: Read Section 4.0 to 4.6 | Lecture: Failure Data & Weibull Analysis<br>Tutorial: Exercises on Weibull Analysis |

### Week 5 - 07 Aug 2023

| Module/Topic  | Chapter                            | Events and Submissions/Topic   |
|---|------------------------------------|--|
| Module 5 – Failure Mode Effect Analysis (FMEA), Failure Mode Effect and Criticality Analysis (FMECA) & reliability Centered Maintenance (RCM) | Module 5: Read Section 5.0 to 5.15 | Lecture: FMEA, FMECA, & RCM<br>Tutorial: Exercises on FMEA, FMECA, & RCM |

### Vacation Week - 14 Aug 2023

| Module/Topic | Chapter    | Events and Submissions/Topic |
|--------------|------------|------------------------------|
| NO LECTURE   | NO LECTURE | NO LECTURE                   |

### Week 6 - 21 Aug 2023

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

|  |                                     |  |
|--|-------------------------------------|--|
| Module 6 – Monte Carlo Simulation, Reliability Block Diagrams, Lifecycle Costing (LCC) | Module 6: Read Section 6.1 to 6.9.3 | Lecture: Monte Carlo Simulation, Reliability Block Diagrams, LCC<br>Tutorial: Exercises on Monte Carlo Simulation, Reliability Block Diagrams, LCC |
|--|-------------------------------------|--|

#### Week 7 - 28 Aug 2023

| Module/Topic                     | Chapter                            | Events and Submissions/Topic   |
|----------------------------------|------------------------------------|--|
| Module 7 –Safety and Reliability | Module 7: Read Section 7.1 to 7.12 | Lecture: Safety and Reliability<br>Tutorial: Exercises on Safety and Reliability |

#### Week 8 - 04 Sep 2023

| Module/Topic  | Chapter                           | Events and Submissions/Topic  |
|---|-----------------------------------|---|
| Module 8 – Reliability Centered Maintenance (RCM) Practical Project | Module 8: Read Section 8.1 to 8.3 | Lecture: RCM Practical Project<br>Tutorial: Exercises on RCM<br><b>Assessment 1 Due, Friday 11:55 pm AEST</b> |
|   |                                   | <b>Assessment 1 Due:</b> Week 8 Friday (8 Sept 2023) 11:55 pm AEST  |

#### Week 9 - 11 Sep 2023

| Module/Topic   | Chapter                           | Events and Submissions/Topic   |
|--|-----------------------------------|--|
| Module 9 – Availability Prediction Practical Project | Module 9: Read Section 9.1 to 9.3 | Lecture: Availability Prediction Practical Project<br>Tutorial: Exercises on Availability Prediction |

#### Week 10 - 18 Sep 2023

| Module/Topic  | Chapter                                | Events and Submissions/Topic   |
|---|--|--|
| Module 10 – Hazards Operations (HAZOP) , vulnerability Assessment & Analysis (VAA) , & Production Reliability | Module 10: Read Sections 10.1 to 10.10 | Lecture: HAZOP, VAA, & Production Reliability<br>Tutorial: Exercises on HAZOP, VAA, & Production Reliability |

#### Week 11 - 25 Sep 2023

| Module/Topic          | Chapter                               | Events and Submissions/Topic  |
|-----------------------|---------------------------------------|---|
| Module 11 – ISO 55001 | Module 11: Read Sections 11.1 to 11.9 | Lecture: ISO 55001<br>Tutorial: Exercises on ISO 55001<br><b>Assessment 2 Due, Friday 11:55 pm AEST</b> |
|                       |                                       | <b>Assessment 2 Due:</b> Week 11 Friday (29 Sept 2023) 11:55 pm AEST                                    |

#### Week 12 - 02 Oct 2023

| Module/Topic   | Chapter                                | Events and Submissions/Topic   |
|--|--|--|
| Module 12 – Return on Investment & Overall Equipment Effectiveness (OEE) | Module 12: Read Sections 12.1 to 12.10 | Lecture: Return on Investment & OEE<br>Tutorial: Exercises on Return on Investment & OEE |

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

| Module/Topic | Chapter | Events and Submissions/Topic                  |
|--------------|---------|---|
|              |         | <b>Assessment 3 Due, Friday 11:55 pm AEST</b> |

#### Exam Week - 16 Oct 2023

| Module/Topic | Chapter | Events and Submissions/Topic  |
|--------------|---------|---|
|              |         | <b>Assessment 3 Due:</b> Exam Week Friday (20 Oct 2023) 11:55 pm AEST |

## Assessment Tasks

### 1 Assessment 1

**Assessment Type**

Written Assessment

**Task Description**

The assignment will cover materials from the topics covered from weeks 1-8. Detail requirements will be discussed in classes. Your answer to this assignment may be unique and include identifying factors influencing the reliability and maintainability in plant operations, applying reliability concepts, tools and techniques to achieve plant integrity, exploring some of the fundamental concepts of root cause analysis, discussing the concept of a structured defect elimination process, applying asset and maintenance management principles to improve organisational effectiveness, developing a safety and risk plan in a maintenance organisation, investigating operational safety and plant integrity in plant operations, your conclusion and references (books, articles, interviews, and other sources).

**Assessment Due Date**

Week 8 Friday (8 Sept 2023) 11:55 pm AEST

**Return Date to Students**

Week 10 Friday (22 Sept 2023)

**Weighting**

40%

**Assessment Criteria**

1. Demonstration of knowledge and comprehensive understanding (40%).
2. Application of concept into real-life situations and communicating with several published/unpublished sources (40%).
3. Quality of presentation including neatness, appropriate use of figures and tables, clarity of expression including use of terminology, ease of reading, grammar and spelling, orderly and logical presentation, and use of diagrams/sketches for illustrations (10%).
4. Evidence of research beyond own experiences and course materials (05%).
5. Appropriate use of referencing (05%).

**Referencing Style**

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

**Submission**

Online

**Learning Outcomes Assessed**

- Identify factors influencing the reliability and maintainability in plant operations.
- Investigate operational safety and plant integrity in plant operations.
- Apply reliability concepts, tools and techniques to achieve plant integrity.

### 2 Assessment 2

**Assessment Type**

Online Test

**Task Description**

The assignment will cover materials from the topics covered in weeks 1 - 10. Detail requirements will be discussed in classes. Your answer to this assignment may be unique and include identifying factors influencing the reliability and maintainability of plant operations, investigating operational

safety and plant integrity in plant operations, and your conclusion and references (books, articles, interviews, and other sources).

**Assessment Due Date**

Week 11 Friday (29 Sept 2023) 11:55 pm AEST

**Return Date to Students**

Review/Exam Week Friday (13 Oct 2023)

**Weighting**

20%

**Assessment Criteria**

1. Demonstration of knowledge and comprehensive understanding (40%).
2. Application of concept into real-life situations and communicating with several published/unpublished sources (40%).
3. Quality of presentation including neatness, appropriate use of figures and tables, clarity of expression including use of terminology, ease of reading, grammar and spelling, orderly and logical presentation, and use of diagrams/sketches for illustrations (10%).
4. Evidence of research beyond own experiences and course materials (05%).
5. Appropriate use of referencing (05%).

**Referencing Style**

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

**Submission**

Online

**Learning Outcomes Assessed**

- Investigate operational safety and plant integrity in plant operations.
- Apply reliability concepts, tools and techniques to achieve plant integrity.
- Develop a safety and risk plan in a maintenance organisation.

### 3 Assessment 3

**Assessment Type**

Written Assessment

**Task Description**

The assignment will cover materials from the topics covered in weeks 1 - 12. Detail requirements will be discussed in classes. Your answer to this assignment may be unique and include exploring some of the fundamental concepts relating factors that influence plant reliability, investigating the operational safety and plant integrity in plant operations, applying the concepts and software tools with techniques to achieve plant integrity, determining the components required to develop a safety and risk plan in a maintenance organisation, your conclusion and references (books, articles, interviews, and other sources)

**Assessment Due Date**

Exam Week Friday (20 Oct 2023) 11:55 pm AEST

**Return Date to Students**

Exam Week Friday (20 Oct 2023)

Results will be released on grade certification date

**Weighting**

40%

**Assessment Criteria**

1. Demonstration of knowledge and comprehensive understanding (40%).
2. Application of concept into real-life situations and communicating with several published/unpublished sources (40%).
3. Quality of presentation including neatness, appropriate use of figures and tables, clarity of expression including use of terminology, ease of reading, grammar and spelling, orderly and



- logical presentation, and use of diagrams/sketches for illustrations (10%).
4. Evidence of research beyond own experiences and course materials (05%).
  5. Appropriate use of referencing (05%).

### Referencing Style

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

### Submission

Online

### Learning Outcomes Assessed

- Identify factors influencing the reliability and maintainability in plant operations.
- Develop a safety and risk plan in a maintenance organisation.

## 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