



# ENEC14016 Traffic and Transportation Engineering

## Term 1 - 2020

Profile information current as at 19/09/2024 08:24 am

All details in this unit profile for ENEC14016 have been officially approved by CQUUniversity 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 project-based learning unit prepares you to describe and explain the fundamental concepts and characteristics of traffic engineering systems. You will be able to develop strategies for managing and controlling traffic, identify safety issues and recommend solutions. You will be able to analyse and design intersections. You will use ethical decision-making processes to design and document pavement requirements. You will apply design codes and manuals to common design problems involving, intersection design and pavement design. You are required to work, learn and communicate effectively in a professional manner, alone and in project teams. You are required to use information literacy skills proficiently to investigate and prepare oral presentations and formal technical reports. If you are enrolled in distance mode, you will be required to attend a residential school during the term.

### Details

Career Level: *Undergraduate*

Unit Level: *Level 4*

Credit Points: *12*

Student Contribution Band: *8*

Fraction of Full-Time Student Load: *0.25*

### Pre-requisites or Co-requisites

Prerequisites: [MATH11218 OR MATH11219] AND ENEC12011

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 - 2020

- 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).

### 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 12-credit Undergraduate unit at CQUniversity requires an overall time commitment of an average of 25 hours of study per week, making a total of 300 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. **Portfolio**

Weighting: 50%

#### 2. **Portfolio**

Weighting: 50%

### 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

##### Feedback

The Moodle site format with Icon to aid navigation was reported as the best aspect of the unit. It was graded 4.5 out of 5.

##### Recommendation

The format of the Moodle site with Icon aiding navigation will be implemented across all units delivered by the lecturer.

#### Feedback from Student Unit Evaluation

##### Feedback

Quick response time to student.

##### Recommendation

The good practice of encouraging students to use the forum in asking questions to be continued. The practice of reviewing posts on the Q & A forum daily with the view to promptly respond will be continued.

#### Feedback from Student Unit Evaluation

##### Feedback

Review of online quiz

##### Recommendation

With the periodic updating of relevant design guides, all previous online quizzes should be reviewed yearly. This will ensure that quizzes are aligned with the current edition of the design guide.

#### Feedback from Reflection

##### Feedback

Assessment structure

##### Recommendation

The capacity analysis task will be reviewed with every delivery. This will ensure that it is aligned with the relevant updated design guides.

## Unit Learning Outcomes

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

1. Analyse traffic flows and describe the effect of key traffic flow parameters and their inter-relationships
2. Apply systematic approaches to conduct capacity analysis and level of-service of roadways and intersections
3. Evaluate the pavement sublayer materials properties using appropriate Australian guidelines
4. Design structural road pavements using appropriate Australian guidelines
5. Demonstrate a professional level of communication and team work

The Learning Outcomes for this unit are linked with **Engineers Australia's Stage 1 Competency Standard.**

## 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



## Textbooks and Resources

### Textbooks

ENEC14016

#### Supplementary

##### **Traffic and Highway Engineering, Enhanced SI Edition**

Edition: 5

Authors: Nicholas J. Garber & Lester A. Hoel

Cengage Learning US

Stamford, CT 06902 , USA

ISBN: 9781337631044

Binding: Paperback

ENEC14016

#### Supplementary

##### **Traffic Engineering**

(2019)

Authors: Roger P. Roess, Elena S. Prassas, William R. McShane

Pearson

ISBN: 9780134599717

Binding: Paperback

#### Additional Textbook Information

Copies can be purchased from the CQUni Bookshop here: <http://bookshop.cqu.edu.au> (search on the Unit code)

[View textbooks at the CQUniversity Bookshop](#)

### IT Resources

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

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- SIDRA
- Pavement Design Software CIRCLY

## Referencing Style

All submissions for this unit must use the referencing style: [Harvard \(author-date\)](#)

For further information, see the Assessment Tasks.

## Teaching Contacts

**Farzaneh Tahmoorian** Unit Coordinator

[f.tahmoorian@cqu.edu.au](mailto:f.tahmoorian@cqu.edu.au)

## Schedule

### Week 1: Traffic Flow Relationship - 09 Mar 2020

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

Traffic Flow Relationships	<ol style="list-style-type: none"> <li>1. Traffic &amp; Highway Engineering by Garber and Hoel SI Edition Chapter 6;</li> <li>2. <a href="#">Guide to Traffic Management Part 2: Traffic Theory (AGTM02-15) Chapter 2 Basic Traffic Variables and Relationships</a></li> <li>3. <a href="#">Guide to Traffic Management Part 2: Traffic Theory (AGTM02-15) Commentary 1 &amp; 2</a></li> <li>4. <a href="#">Guide to Traffic Management Part 2: Traffic Theory (AGTM02-15) Chapter 7</a></li> </ol>
----------------------------	---

### Week 2: Capacity and Level of Service Concepts - 16 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
Capacity and Level of Service Concepts	<ol style="list-style-type: none"> <li>1. <a href="#">Highway Capacity Manual (2016) Chapters 4 &amp;5;</a></li> <li>2. <a href="#">Guide to Traffic Management Part 3: Traffic Studies and Analysis (AGTM03-17) Chapter 3 &amp; 4</a></li> </ol>	Traffic Engineering Portfolio Quiz 1 due on Friday 20/03/20 @17:00

### Week 3:Capacity Analysis I - 23 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
Highway Capacity Analysis	<ol style="list-style-type: none"> <li>1. <a href="#">Highway Capacity Manual (2016) Chapters 12;</a></li> <li>2. <a href="#">Guide to Traffic Management Part 3: Traffic Studies and Analysis (AGTM03-17) Chapter 4</a></li> <li>3. Traffic &amp; Highway Engineering by Garber and Hoel SI 5th Edition Chapter 9 pages 465 to 493</li> </ol>	Traffic Engineering Portfolio Quiz 2 due Friday 27/03/20 @17:00

### Week 4:Capacity Analysis II - 30 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
Freeway Capacity Analysis	<ol style="list-style-type: none"> <li>1. <a href="#">Highway Capacity Manual (2016) Chapters 10 &amp; 11</a></li> <li>2. <a href="#">Guide to Traffic Management Part 3: Traffic Studies and Analysis (AGTM03-17) Chapter 4</a></li> <li>3. Traffic &amp; Highway Engineering by Garber and Hoel SI 5th Edition Chapter 9 pages 447 to 465</li> </ol>	

### Week 5:Capacity Analysis III - 06 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic
Freeway Capacity Analysis: Merge, Diverge and Weaving Segment	<a href="#">Highway Capacity Manual (2016) Chapters 14</a>	

### Vacation Week - 13 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic

### Week 6:Signalised & Unsignalised Intersection Capacity Analysis - 20 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic
Signalised & Unsignalised Intersection Capacity Analysis	<ol style="list-style-type: none"> <li>1. <a href="#">Guide to Traffic Management Part 3: Traffic Studies and Analysis (AGTM03-17) Chapter 6</a></li> <li>2. <a href="#">Guide to Traffic Management Part 6: Intersection, Interchanges and Crossing (AGTM06-17) Chapter 4</a></li> <li>3. <a href="#">Guide to Traffic Management Part 6: Intersection, Interchanges and Crossing (AGTM06-17) Chapter 5</a></li> <li>4. Traffic &amp; Highway Engineering by Garber and Hoel SI 5th Edition Chapter 8 &amp;10</li> </ol>	Traffic Engineering Portfolio Quiz 3 due on Friday 24/04/20 @17:00

**Week 7: Design of Flexible Pavement I - 27 Apr 2020**

Module/Topic	Chapter	Events and Submissions/Topic
Design of Flexible Pavement I	<a href="#">Guide to Pavement Technology Part 2: Pavement Structural Design (AGPT02-19) Chapter 8;</a>	

**Week 8: Design of Flexible Pavement II - 04 May 2020**

Module/Topic	Chapter	Events and Submissions/Topic
Design of Flexible Pavement II	<a href="#">Guide to Pavement Technology Part 2: Pavement Structural Design (AGPT02-19) Chapter 8;</a>	

**Week 9: Design of Rigid Pavement I - 11 May 2020**

Module/Topic	Chapter	Events and Submissions/Topic
Design of Rigid Pavement I	<a href="#">Guide to Pavement Technology Part 2: Pavement Structural Design (AGPT02-19) Chapter 9;</a>	

**Week 10: Design of Rigid Pavement II - 18 May 2020**

Module/Topic	Chapter	Events and Submissions/Topic
Design of Rigid Pavement II	<a href="#">Guide to Pavement Technology Part 2: Pavement Structural Design (AGPT02-19) Chapter 9;</a>	

**Week 11: Design of Structural Overlay - 25 May 2020**

Module/Topic	Chapter	Events and Submissions/Topic
Design of Overlay	<a href="#">Guide to Pavement Technology Part 5: Pavement Evaluation and Design (AGPT05-19) Chapter 9 &amp; 10</a>	

**Week 12: Review - 01 Jun 2020**

Module/Topic	Chapter	Events and Submissions/Topic
		Pavement Design Portfolio Quiz due date on Friday 05/06/20 @17:00

**Review/Exam Week - 08 Jun 2020**

Module/Topic	Chapter	Events and Submissions/Topic

**Exam Week - 15 Jun 2020**

Module/Topic	Chapter	Events and Submissions/Topic

## Assessment Tasks

### 1 Traffic Engineering

**Assessment Type**

Portfolio

**Task Description**

This portfolio contributes 50 marks out of 100 marks. It consists of three independent assessment tasks. This assessment focus on weeks 1 to 6 content.

This assessment item relates to the unit learning outcomes 1, 2, 5 and 6. It develops students' ability to understand capacity analysis procedures for both roadways and intersections using current Australian Guidelines and Design Practices. Use of SIDRA software (intersection design software) is highly recommended when applicable.

**Quizzes (10 Marks):**

Complete three Moodle quizzes

More detail available in Moodle

**Roadway Capacity Analysis Task (10 Marks):**

Road Authority in Queensland is currently considering upgrading an existing suburban multi-lane road to a

motorway in Brisbane due to severe traffic delays (based on the public complaints) during peak periods. As a traffic engineer, you were asked to collect data for the existing condition, analyse the existing condition and appropriate recommendation to improve capacity and level of service. Over several months.

More Detail information provided in Moodle

## **Intersection Capacity Analysis Task (30 Marks)**

### **BACKGROUND**

The intersection of Wellington Road and Kelletts Road is in the suburb of Lysterfield in Melbourne's outer eastern suburbs. It is a "T" shaped intersection currently controlled by Give Way signs. There have been 11 casualty crashes in the last 5 years. The road authority is considering whether to upgrade the intersection to a roundabout or traffic signals.

### **YOUR TASKS**

The senior traffic engineer responsible for this area has asked you for a report with sufficient analysis of different forms of intersection control for this site. You have been asked to assess the traffic and safety performance and consider all other matters relating to the choice of intersection control and write a report justifying your recommended treatment.

Provide a functional geometric design layout plan of the intersection for your recommended treatment - either traffic signals or a roundabout.

### **METHOD**

Use SIDRA to analyse the following:

- the existing intersection with Give Way signs, with existing traffic volumes
- a roundabout
- traffic signals.

For a comparative check, also calculate the capacity and degree of saturation of the main movements at the existing unsignalised intersection, using manual methods.

You will need to analyse the intersection for the morning and afternoon peak hourly volumes.

For the traffic signals case, you need to analyse several options to determine the most efficient geometry and phasing that gives the best intersection performance. Some choices will also depend on your assessment of safety. Right turn movements may be fully controlled, partially controlled or filter only. You must present the SIDRA outputs in the Appendices to your report for at least 3 sensible variations.

Generally, assume that parameters are the same as SIDRA defaults. However, these may be modified if this would result in a more realistic assessment.

More detail available in Moodle

### **Assessment Due Date**

Due date is varied for each task in the portfolio. Detail respect date is in Moodle

### **Return Date to Students**

After 10 working days

### **Weighting**

50%

### **Minimum mark or grade**

50%

### **Assessment Criteria**

The marking matrix shall be based on the content consisting of the following principles. Each sequential step shall be allocated marks proportionately

1. Accuracy of Input parameter for each computation step with appropriate unit. Marks will only be awarded for correct input
2. Application of accurate methodology with appropriate referencing. Full mark will only be awarded for error free computational steps with appropriate explanation to be understood by an independent person.
3. Accuracy of answer with appropriate unit. Zero mark will be awarded with error in either Input or methodology.
4. If answers to any preceding steps are inaccurate. Partial mark be awarded for subsequent answers.

Additional information should be obtained from the Moodle Unit web-page



## Referencing Style

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

## Submission

Online

## Submission Instructions

See Moodle for detail

## Graduate Attributes

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

## Learning Outcomes Assessed

- Analyse traffic flows and describe the effect of key traffic flow parameters and their inter-relationships
- Apply systematic approaches to conduct capacity analysis and level of-service of roadways and intersections
- Demonstrate a professional level of communication and team work

## 2 Pavement Design

### Assessment Type

Portfolio

### Task Description

This assessment item relates to the unit learning outcomes 3, 4, 5 and 6. It develops students' ability to understand Australian pavement design system, materials and tests and design of alternative pavement configurations (flexible pavements, rigid pavements and structural overlays) using current Australian Guidelines and Design Practices. Use of CIRCLY software (pavement design software) is highly recommended when required.

- **Quiz (5 Marks)**

Complete quizzes online.

More details available in Moodle

- **Laboratory Task (10)**

- You will complete the practical activities and the laboratory report as a team.
- On-campus students will complete the practical activities between Weeks 5 and 9 of term.
- Each team should check their schedule timetable as shown in Moodle
- Distance students will complete the practical activities during the Residential School in Week 8.
- All teams will upload a single team report due as per the Unit Profile.
- The required practical activities are as follows
  - Preparation disturbed soil sample for testing
  - Soil Compaction and density test [AS1289.5.2.2017](#)
  - Determination of the penetration resistance of a soil [AS1289.6.3.2](#)
  - Determination of the California Bearing Ratio of a soil [AS1289.6.1.1](#)
  - Lime demand of soil [Q133](#)

- **Design Task 1: Flexible pavement design (25 marks)**

Geometric design, earth moving and subgrade evaluation of a new two-lane two-way road has been recently completed and now it is time for design of pavement in rural Queensland. A new flexible pavement is to be designed and you are tasked to develop flexible pavement alternatives for further consideration. The following are the project specific information supplied by the client (Road Authority in Queensland):



- Two way total AADT=4000+(the last four digits of your student ID)/10
- Pavement design period 30 years.
- Project reliability 95%.
- Lane width= 3.5m.
- Directional distribution 60/40
- Subgrade CBR value = 3 (if the last four digits of your student ID is < 3000), 5 (if the last four digits of your student ID is ≥ 3000 but < 6000) and 7 (if the last four digits of your student ID is ≥ 6000)

- Heavy vehicles = 8% (if the last four digits of your student ID is < 3000), 9% (if the last four digits of your student ID is ≥ 3000 but <6000) and 10% (if the last four digits of your student ID is ≥6000)
- Annual heavy vehicle growth is 1% throughout the design period
- Other required information can be assumed within Australian Standard (Austroads Guides)
- Summarise and calculate required flexible pavement design input parameters (5 marks)
- Design the following flexible pavement alternatives using mechanistic or graphical methods (as applicable, appropriate or preferred!). You need to draw final design drawings for all cases (not to scale is acceptable but indicate all required dimensions and units of measurements). You must discuss/interpret everything you calculate or present.
  - Alternative 1: Heavy duty unbound granular pavement with sprayed seal surfacing (5 marks)
  - Alternative 2: Asphalt over granular pavement (AC14M & AC20M) (5 marks)
  - Alternative 3: Deep strength asphalt pavement (AC14M & AC20M) **(5 marks)**
  - Alternative 4: Asphalt over heavily bound (cemented) pavement (AC14M & AC20M) **(5 marks)**

### **Design Task 2: Rigid Pavement design (10 Marks)**

For the same road location and information (described above in Design Task 1), Road Authority in Queensland also asked you to develop rigid pavement design alternatives.

- Summarise and calculate required rigid pavement design input parameters **(2 marks)**
- Design the following rigid pavement alternatives using analytical or graphical methods (as applicable or appropriate or preferred!). You need to draw final design drawings for all cases (not to scale is acceptable but indicate all required dimensions and units of measurements). You must discuss/interpret everything you calculate or present.
  - Alternative 1: PCP pavement without concrete shoulder (4 marks)
  - Alternative 2: CRCP pavement with concrete shoulder (4 marks)

### **Assessment Due Date**

Due date is varied for each task in the portfolio. Detail respect date is in Moodle

### **Return Date to Students**

After 10 working days

### **Weighting**

50%

### **Minimum mark or grade**

50%

### **Assessment Criteria**

The marking matrix shall be based on the content consisting of the following principles. Each sequential step shall be allocated marks proportionately

1. Accuracy of Input parameter for each computation step with appropriate unit. Marks will only be awarded for correct input
2. Application of accurate methodology with appropriate referencing. Full mark will only be awarded for error free computational steps with appropriate explanation to be understood by an independent person.
3. Accuracy of answer with appropriate unit. Zero mark will be awarded with error in either Input or methodology.
4. If answers to any preceding steps are inaccurate. Partial mark be awarded for subsequent answers.

Additional information should be obtained from the Moodle Unit web-page

### **Referencing Style**

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

### **Submission**

Online

### **Submission Instructions**

See Moodle for detail

## Graduate Attributes

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

## Learning Outcomes Assessed

- Evaluate the pavement sublayer materials properties using appropriate Australian guidelines
- Design structural road pavements using appropriate Australian guidelines
- Demonstrate a professional level of communication and team work

## 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