



# **ENEM12006 *Fluid Mechanics***

## **Term 2 - 2023**

Profile information current as at 29/04/2024 08:52 am

All details in this unit profile for ENEM12006 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 fundamental properties of fluids, analysis of pipe flow, buoyancy, and stability of floating objects. It presents methods of analysing fluid systems using the concept of a control volume combined with the conservation of mass and momentum equations. You analyse incompressible flows in pipe systems and use similitude and modelling principles and techniques to solve problems in fluid mechanics. You will prepare technical and laboratory reports using appropriate 'mechanical engineering language', and document the process of modelling and analysis. You will use ANSYS Fluent software or equivalent to model fluid behaviour inside pipes and other mediums. You are required to act professionally in presenting information, communicating, working, and learning, both individually and in teams. 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 2*

Credit Points: 6

Student Contribution Band: 8

Fraction of Full-Time Student Load: 0.125

### Pre-requisites or Co-requisites

Prerequisites: MATH11219 Engineering Mathematics AND ENEG11006 Engineering Statics.

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. **Practical and Written Assessment**

Weighting: 20%

#### 2. **Written Assessment**

Weighting: 20%

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

Weighting: 20%

#### 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 email.

**Feedback**

Students appreciate the teaching strategies.

**Recommendation**

The practice should continue in the future offering.

#### Feedback from Student email

**Feedback**

Students appreciated that the Moodle site was set out well.

**Recommendation**

The practice should continue in the future offering.

#### Feedback from Have you Say

**Feedback**

Some students felt and reported that the assignment tasks were too high in terms of question numbers.

**Recommendation**

The unit assessments should be reviewed and will be shortened in the next offering.

#### Feedback from Have you Say

**Feedback**

Some laboratory experience was unsatisfactory as lab supervisors sometimes had difficulties operating the equipment.

**Recommendation**

Lab equipment should be checked before the labs to identify possible issues and the lab supervisors should be provided with adequate training to confidently operate the equipment.

#### Feedback from Have you Say

**Feedback**

The students' satisfaction regarding the assessment's feedback was a bit low.

**Recommendation**

The feedback for students should be given based on their thinking ability, the accuracy of numerical calculations, and the problem-solving approach that students will need to acquire these skills so that they don't come up with wrong processes or repeat common errors. This practice was also conducted in previous years and should carefully be looking at the next offering.

## Unit Learning Outcomes

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

1. Apply the fundamentals of fluid mechanics to investigate pressure, buoyancy and hydrostatic forces
2. Analyse fluid motion by applying the conservation of mass and momentum in real-world engineering contexts
3. Identify the fluid flow regimes to apply Bernoulli Equation in pipe flows
4. Create solutions to fluid systems using similitude and modelling techniques
5. Measure flow regimes, rates and other basic fluid flow characteristics and compare with analytical data
6. Work autonomously and in teams to prepare reports using appropriate engineering language.

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 2.3 Application of systematic engineering synthesis and design processes. (LO: 1N 5N 6N )**

**Intermediate 1.4 Discernment of knowledge development and research directions within the engineering discipline. (LO: 1I 2I 3I 4I 5I 6I ) 1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline. (LO: 1N 4N 6I ) 1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline. (LO: 1I 2I 3I 4I 6I ) 2.2 Fluent application of engineering techniques, tools and resources. (LO: 1N 2N 3N 4I 5N 6I ) 3.2 Effective oral and written communication in professional and lay domains. (LO: 1I 2I 5N 6I ) 3.3 Creative, innovative and pro-active demeanour. (LO: 2N 4I 5I 6I ) 3.4 Professional use and management of information. (LO: 1I 2I 3I 4I 5I 6I ) 3.5 Orderly management of self, and professional conduct. (LO: 4I 6I )**

**Advanced 1.1 Comprehensive, theory-based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline. (LO: 1N 3I 4A 5A 6I ) 1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline. (LO: 1I 2I 3I 4A 5A 6I ) 1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline. (LO: 1I 2I 3I 4I 5I 6A ) 2.1 Application of established engineering methods to complex engineering problem solving. (LO: 1I 2I 3I 4A 5A 6I ) 3.1 Ethical conduct and professional accountability. (LO: 6A ) 3.6 Effective team membership and team leadership. (LO: 6A )**

**Note: LO refers to the Learning Outcome number(s) which link to the competency and the levels: N - Introductory, I - Intermediate and A - Advanced.**

Refer to the Engineering Undergraduate Course Moodle site for further information on the Engineers Australia's Stage 1 Competency Standard for Professional Engineers and course level mapping information <https://moodle.cqu.edu.au/course/view.php?id=1511>



## Alignment of Learning Outcomes, Assessment and Graduate Attributes



### Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes					
	1	2	3	4	5	6
1 - Practical and Written Assessment - 20%					•	•
2 - Written Assessment - 20%	•					
3 - Written Assessment - 20%		•	•	•		
4 - Online Test - 40%	•	•	•	•	•	

### Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes					
	1	2	3	4	5	6
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

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#### Prescribed

##### **Munson's Fluid Mechanics 8th Edition (2017)**

Edition: 8 (2017)

Authors: P.M.; Gerhart, A. L.; Hochstein, J.I.

John Wiley & Sons

Hoboken , NJ , USA

ISBN: 9781119248989

Binding: Hardcover

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#### Supplementary

##### **Elementary Fluid Mechanics 7th Edition (1996)**

Edition: 7 (1996)

Authors: Street, R.L., Watters, G.Z. and Vennard, J.K.

John Wiley & Sons

New York , NY , USA

ISBN: 9780471013105

Binding: Hardcover

[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

**Nur Hassan** Unit Coordinator

[n.hassan@cqu.edu.au](mailto:n.hassan@cqu.edu.au)

## Schedule

### Week 1 - 10 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
Unit Overview and Fluid properties	1	Tutorial 1: Fluid properties

### Week 2 - 17 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
Fluid Statics and Manometry	2	Tutorial 2: Fluids Statics and Manometry

### Week 3 - 24 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
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Equilibrium, Buoyancy and Forces on Submerged Bodies	2	Tutorial 3: Buoyancy and Forces on Submerged Bodies
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#### Week 4 - 31 Jul 2023

Module/Topic	Chapter	Events and Submissions/Topic
Eulerian and Lagrangian mechanics, One dimensional flow, Euler's equation and Bernoulli's equation	3 and 4	Tutorial 4: Euler's equation and Bernoulli's equation

#### Week 5 - 07 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
Control Volume, Conversion of Mass, Momentum Equation	4, 5 and 6	Tutorial 5: Control Volume, Conversion of Mass, and Momentum Equation

#### Vacation Week - 14 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
Non teaching week	Self reading	No tutorial. For more information, see Handbook

#### Week 6 - 21 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
		Tutorial 6: Momentum Equation

Application of Momentum Equation	6	
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**Assignment 1** Due: Week 6 Monday (21 Aug 2023) 11:55 pm AEST

#### Week 7 - 28 Aug 2023

Module/Topic	Chapter	Events and Submissions/Topic
Boundary Layer Concept, Laminar and Turbulent Flow, Reynolds Stress	6, 8 and 9	Tutorial 7: Boundary Layer Concept, Laminar and Turbulent Flow, Reynolds Stress

#### Week 8 - 04 Sep 2023

Module/Topic	Chapter	Events and Submissions/Topic
Incompressible Flow in Pipes, Moody Diagram, Pipe Bends, and Fittings, Measurement of Fluid Flow	8	Tutorial 8: Incompressible Flow in Pipes

#### Week 9 - 11 Sep 2023

Module/Topic	Chapter	Events and Submissions/Topic
		Tutorial 9: Dimensional Analysis

Dimensional Analysis, Buckingham Pi Theorem, Common Dimensionless Numbers	7	
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**Laboratory Reports** Due: Week 9 Friday (15 Sept 2023) 11:55 pm AEST

#### Week 10 - 18 Sep 2023

Module/Topic	Chapter	Events and Submissions/Topic
Dynamic Similarity, Modelling Technique and Experimentation	7	Tutorial 10: Dynamic Similarity, Modelling Technique and Experimentation

#### Week 11 - 25 Sep 2023

Module/Topic	Chapter	Events and Submissions/Topic



Viscous Effects, Navier Stoke's equation and Computaional Fluid Dynamic

6

Tutorial 11: Viscous Effects, Navier Stoke's Equation, and Computational Fluid Dynamic (CFD)

**Assignment 2** Due: Week 11 Friday (29 Sept 2023) 11:55 pm AEST

### Week 12 - 02 Oct 2023

Module/Topic	Chapter	Events and Submissions/Topic
Reveiw	Sample problems	Revision: tutorials and previous exam problems

### Review/Exam Week - 09 Oct 2023

Module/Topic	Chapter	Events and Submissions/Topic
Unit review	Self Study	

### Exam Week - 16 Oct 2023

Module/Topic	Chapter	Events and Submissions/Topic
		Online test Due: Exam Week Friday (20 Oct 2023) 10:00 AM AEST
		<b>Online test</b> Due: Exam Week Friday (20 Oct 2023) 10:00 am AEST

## Assessment Tasks

### 1 Laboratory Reports

#### Assessment Type

Practical and Written Assessment

#### Task Description

Each student will be required to complete the laboratory exercises as per the instruction sheets. Students will require to be familiar with the ANSYS code "Fluent" and how to mimic the fluid flows in a small pipe. Students will be required to validate the simulation results with the extracted data from the experimentations. Students will be performing this activity only for the Flow rate measurement and pipe flow experiment. All instructios will be provided in the instruction manuals and uploaded to the unit website. Laboratory sessions are compulsory, and each session will be up to 2 hours in duration. The timetable of laboratories will be supplied separately via the unit website (Moodle).

The following laboratory activities will be conducted by all students:

1. Flow Rate Measurement and Pipe Flow.
2. Stability of Floating Bodies and Centre of Pressure.
3. Wind Tunnels Tests.

#### Assessment Due Date

Week 9 Friday (15 Sept 2023) 11:55 pm AEST  
Submission should be via unit website (Moodle)

#### Return Date to Students

Week 11 Monday (25 Sept 2023)  
In two weeks from the date of submission

#### Weighting

20%

#### Minimum mark or grade

You must get a minimum 50% on this assesemnt item to secure a Pass in this unit

#### Assessment Criteria

Reporting of major elements/steps (eg. Theory, Objective, Procedures, Results etc) taken to undertake the laboratory sessions (40% of total marks).

Clarity of expression, including correct grammar, spelling, punctuation and appropriate referencing of sources (10% of total marks).

Accurate and correct use and presentation of mathematical equations or graphs, tables, diagrams and/or drawings (30% of total marks).

Discussion and logical presentation of ideas and arguments by means of data analysis and synthesis (20% of total marks).

### Referencing Style

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

### Submission

Online Group

### Submission Instructions

Submission should be via unit website (Moodle)

### Learning Outcomes Assessed

- Measure flow regimes, rates and other basic fluid flow characteristics and compare with analytical data
- Work autonomously and in teams to prepare reports using appropriate engineering language.

## 2 Assignment 1

### Assessment Type

Written Assessment

### Task Description

This assignment covers the weekly topics from Week 1 to Week 5. Students are required to answer analytical and numerical as well as multiple-choice questions. The assignment tasks will be uploaded on the unit website (Moodle).

### Assessment Due Date

Week 6 Monday (21 Aug 2023) 11:55 pm AEST

Online submission through Moodle Website.

### Return Date to Students

Week 8 Monday (4 Sept 2023)

In two weeks from the date of submission

### Weighting

20%

### Minimum mark or grade

You must get a minimum 50% on this assessment item to secure a Pass in this unit

### Assessment Criteria

Each question in the assignment will be assessed separately against the following criterion:

20% of the total marks are for accuracy and correct result

The correct application of maths and arithmetic

The correct answer to the questions

Correct use of terminology, units, and conventions

40% for correct method and procedure

The correct selection and application of formula and maths

Clear presentation of mathematical and arithmetical calculations for the results obtained

Evidence of checking results (mathematical, graphical, etc.)

30% for evidence of understanding

Explanation of choices made (why a particular procedure/method is selected)

Interpretation of results including limitations etc, if any

Correct and orderly procedures and required steps

10% for a professional presentation

Clear identification and statement of each problem

A logical layout of analysis

Appropriate use of diagrams

### Referencing Style

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

### Submission

Online

### Submission Instructions

Submission should be via unit website (Moodle)

### Learning Outcomes Assessed

- Apply the fundamentals of fluid mechanics to investigate pressure, buoyancy and hydrostatic forces

## 3 Assignment 2

### Assessment Type

Written Assessment

### Task Description

This assignment covers the weekly topics from Week 6 to Week 11. Students are required to answer analytical and numerical questions as well as multiple-choice questions. The assignment tasks will be uploaded on the unit website (Moodle).

### Assessment Due Date

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

Online submission through Moodle.

### Return Date to Students

Review/Exam Week Friday (13 Oct 2023)

In two weeks from the date of submission

### Weighting

20%

### Minimum mark or grade

You must get a minimum 50% on this assessment item to secure a Pass in this unit

### Assessment Criteria

Each question in the assignment will be assessed separately against the following criterion:

20% of the total marks are for accuracy and correct result

Correct application of maths and arithmetic

The correct answer to the questions

The correct use of terminology, units, and conventions

40% for correct method and procedure

Correct selection and application of formula and maths

Clear presentation of mathematical and arithmetical calculations for the results obtained

Evidence of checking results (mathematical, graphical, etc.)

30% for evidence of understanding

Explanation of choices made (why a particular procedure/method is selected)

Interpretation of results including limitations etc, if any

Correct and orderly procedures and required steps

10% for a professional presentation

Clear identification and statement of each problem

A logical layout of the analysis

Appropriate use of diagrams

### Referencing Style

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

### Submission

Online

### Submission Instructions

Submission should be via unit website (Moodle)

### Learning Outcomes Assessed

- Analyse fluid motion by applying the conservation of mass and momentum in real-world engineering contexts
- Identify the fluid flow regimes to apply Bernoulli Equation in pipe flows
- Create solutions to fluid systems using similitude and modelling techniques

## 4 Online test

### Assessment Type

Online Test

### Task Description

An online test will be scheduled during the exam week. The online questions will be uploaded in Moodle and will be available to all students at the same time. Students download the Exam paper and start working on the solution.

Students are given three hours to complete the solution. An additional one hour is considered to provide them for downloading, uploading, and perusal of the questions. Students use blank A4 papers to write answers. Students upload their answer booklet as a single pdf file on Moodle.

**Assessment Due Date**

Exam Week Friday (20 Oct 2023) 10:00 am AEST

Students upload their answers as a single pdf file on Moodle.

**Return Date to Students**

Certification date.

**Weighting**

40%

**Minimum mark or grade**

You must get a minimum 50% on this assessemnt item to secure a Pass in this unit

**Assessment Criteria**

Students can use Dictionary - non-electronic, concise, direct translation only (dictionary must not contain any notes or comments). Students can use a calculator - all non-communicable calculators, including scientific, programmable, and graphics calculators are authorised. Each question in the exam will be assessed separately against the following criterion:

- 20% of the total marks are for accuracy and correct results;
- Correct application of maths and arithmetic;
- The correct answer to the questions;
- Correct use of terminology, units, and conventions;
- 50% for correct method and procedure;
- Correct selection and application of formula and maths;
- Clear presentation of mathematical and arithmetical calculations for the results obtained;
- 30% for evidence of understanding.

**Referencing Style**

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

**Submission**

Online

**Submission Instructions**

Students upload their answers as a single pdf file on Moodle.

**Learning Outcomes Assessed**

- Apply the fundamentals of fluid mechanics to investigate pressure, buoyancy and hydrostatic forces
- Analyse fluid motion by applying the conservation of mass and momentum in real-world engineering contexts
- Identify the fluid flow regimes to apply Bernoulli Equation in pipe flows
- Create solutions to fluid systems using similitude and modelling techniques
- Measure flow regimes, rates and other basic fluid flow characteristics and compare with analytical data

## 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