



ENEM20002 *Fluid Power Engineering and Control*

Term 1 - 2020

Profile information current as at 01/07/2022 01:57 pm

All details in this unit profile for ENEM20002 have been officially approved by CQUiversity 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.

Corrections

Unit Profile Correction added on 06-05-20

Due to COVID-19, the invigilated final examination scheduled for ENEM20002, T1-2020, will be replaced by an online QUIZ (short questions + long questions requiring problem solving). The QUIZ questions will address the same learning outcomes as the exam. More details will be available in the Unit Moodle site.

General Information

Overview

This project-based unit is about designing fluid power systems for automated and semiautomated industrial plants. This unit deals with exploring fluid power elements and their ISO standard symbols, designing fluid power circuits using actuators, directional control and other valves, sensors and control systems. Control technology may include both hydraulic and pneumatic systems integrated with programmable controllers (PLCs and micro-controllers). In small teams, you will undertake project work involving solving real-life industrial problems. There are also several laboratory experiments in areas of hydraulic and pneumatic operating system design and control circuit design integrated with PLCs for automated machines. You will use simulation software (SimScape and/or FluidSim) for confirming the functionality of designed projects prior to prototyping. You will communicate professionally using discipline-specific terminology to present designs and problem solutions. Students enrolled in online mode must attend a compulsory residential school to facilitate peer collaboration and attainment of the unit learning outcomes.

Details

Career Level: *Postgraduate*

Unit Level: *Level 8*

Credit Points: *12*

Student Contribution Band: *8*

Fraction of Full-Time Student Load: *0.25*

Pre-requisites or Co-requisites

There are no requisites for this unit.

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

- Melbourne
- Perth
- 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 12-credit Postgraduate 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. **Written Assessment**

Weighting: 20%

2. **Written Assessment**

Weighting: 20%

3. **Laboratory/Practical**

Weighting: 20%

4. **Examination**

Weighting: 40%

Assessment Grading

This is a graded unit: your overall grade will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. You must obtain an overall mark for the unit of at least 50%, or an overall grade of 'pass' in order to pass the unit. If any 'pass/fail' tasks are shown in the table above they must also be completed successfully ('pass' grade). You must also meet any minimum mark requirements specified for a particular assessment task, as detailed in the 'assessment task' section (note that in some instances, the minimum mark for a task may be greater than 50%). Consult the [University's Grades and Results Policy](#) for more details of interim results and final grades.

CQUniversity Policies

All University policies are available on the [CQUniversity Policy site](#).

You may wish to view these policies:

- Grades and Results Policy
- Assessment Policy and Procedure (Higher Education Coursework)
- Review of Grade Procedure
- Student Academic Integrity Policy and Procedure
- Monitoring Academic Progress (MAP) Policy and Procedure – Domestic Students
- Monitoring Academic Progress (MAP) Policy and Procedure – International Students
- Student Refund and Credit Balance Policy and Procedure
- Student Feedback – Compliments and Complaints Policy and Procedure
- Information and Communications Technology Acceptable Use Policy and Procedure

This list is not an exhaustive list of all University policies. The full list of University policies are available on the [CQUniversity Policy site](#).

Previous Student Feedback

Feedback, Recommendations and Responses

Every unit is reviewed for enhancement each year. At the most recent review, the following staff and student feedback items were identified and recommendations were made.

Feedback from Through Moodle site

Feedback

The delivery of this unit was done in a professional manner. Students content knowledge and learning of Fluid Power systems evolved. They enjoyed all aspects of this unit.

Recommendation

Keep it up and improve it further.

Feedback from Through Moodle site

Feedback

More demonstrations SimScape simulations.

Recommendation

More demonstrations will be included in the next delivery.

Unit Learning Outcomes

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

1. Design complex fluid drives and analyse their performance
2. Evaluate advanced applications of drive systems in industrial plants
3. Design fluid control circuits integrated with programmable controllers for automated machine systems
4. Design and analyse electro-mechanical and fluid control power and energy conversion systems
5. Design protection and control systems for fluid power machines
6. Analyse electro-mechanical power and energy conversion
7. Create professional documentation using terminology, symbols and diagrams related to electric and fluid drives.

The learning outcomes are linked to Engineers Australia Stage 1 Competency Standard and Australian Qualification Framework (AQF) 9 Level.

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	7
1 - Written Assessment - 20%	•	•					•
2 - Written Assessment - 20%			•		•	•	
3 - Laboratory/Practical - 20%		•	•	•			•
4 - Examination - 40%	•			•	•	•	

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes						
	1	2	3	4	5	6	7
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							

Alignment of Assessment Tasks to Graduate Attributes

Assessment Tasks	Graduate Attributes							
	1	2	3	4	5	6	7	8
1 - Written Assessment - 20%	○	○	○	○	○			
2 - Written Assessment - 20%	○		○	○				
3 - Laboratory/Practical - 20%		○				○		
4 - Examination - 40%	○		○					

Textbooks and Resources

Textbooks

ENEM20002

Prescribed

Fluid Power with Applications

Authors: Anthony Esposito

Pearson

Essex, UK, UK

ISBN: 13:978-1-292-02387-8

Binding: Paperback

Additional Textbook Information

Paper 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)

Referencing Style

All submissions for this unit must use the referencing style: [Vancouver](#)

For further information, see the Assessment Tasks.

Teaching Contacts

Abdul Mazid Unit Coordinator

a.mazid@cqu.edu.au

Schedule

Week 1 - 09 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
Lec 1: Fluid Properties (2 hrs)	2	Workshop on projects (2 hrs)

Week 2 - 16 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
Lec 2: Hydraulic Pumps (2 hrs)	5	Workshop on projects (2 hrs); Tutorial 1: Fluid Properties - 2 hrs (Tutorial problems available in Unit Moodle website).

Week 3 - 23 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
Lec 3: Hydraulic Motors (2 hrs)	7	Workshop on projects (2 hrs); Tutorial 2: Hydraulic Pumps - 2 hrs (Tutorial problems available in Unit Moodle website) ; Lab experiment on Hydraulics (2 hrs).

Week 4 - 30 Mar 2020

Module/Topic	Chapter	Events and Submissions/Topic
Lec 4: Hydraulic Actuators and Cushioning (2 hrs)	6	Workshop on projects (2 hrs); Tutorial 3: Hydraulic Motors - 2 hrs (Tutorial problems available in Unit Moodle website); Lab experiment on Hydraulics (2 hrs)

Week 5 - 06 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic
Lec 5: Hydraulic Valves (2 hrs)	8	Project Presentation in Workshop; Tutorial 4: Hydraulic Actuators and Cushioning - 2 hrs (Tutorial problems available in Unit Moodle website); Lab experiments on Hydraulics (2 hrs)

Vacation Week - 13 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic
		Work on completion of project

Week 6 - 20 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic
Lec 6: Fluid Control Circuit Design (2 hrs)	14	Workshop on projects (2 hrs); Tutorial 5: Hydraulic Valves - 2 hrs (Tutorial problems available in Unit Moodle website). Assignment 1 (Project 1) Due: Week 6 Monday (20 Apr 2020) 11:45 pm AEST

Week 7 - 27 Apr 2020

Module/Topic	Chapter	Events and Submissions/Topic
Lec 7: Electric Circuits in Fluid Control Systems (2 hrs)	15 and Lecture notes	Workshop on projects (2 hrs); Tutorial 6: Fluid Control Circuit Design - 2 hrs (Tutorial problems available in Unit Moodle website).

Week 8 - 04 May 2020

Module/Topic	Chapter	Events and Submissions/Topic
Lec 8: PLC Architecture and Programming (2 hrs)	17 and Lecture notes	Workshop on projects (2 hrs); Tutorial 7: Fluid Control Circuit Design and PLC Programming - 2 hrs (Tutorial problems available in Unit Moodle website); Lab experiment on Pneumatic Control (2 hrs)

Week 9 - 11 May 2020

Module/Topic	Chapter	Events and Submissions/Topic
Lec 9: Pneumatic Control Elements (2 hrs)	14 and Lecture materials	Workshop on projects (2 hrs) Tutorial 8: PLC Programming - 2 hrs (Tutorial problems available in Unit Moodle website) Lab experiment on Pneumatic Control (2 hrs).

Week 10 - 18 May 2020

Module/Topic	Chapter	Events and Submissions/Topic

Lec 10: Pneumatic Logic Elements (2 hrs)

16 and Lecture materials

Workshop on projects (2 hrs).
Tutorial 9: Pneumatic Control Elements - 2 hrs (Tutorial problems available in Unit Moodle website)
Lab experiment on PLC and Pneumatic Control (2 hrs).

Week 11 - 25 May 2020

Module/Topic

Chapter

Events and Submissions/Topic

Lec 11: Pneumatic Sensors (2 hrs)

Lecture materials

Project Presentation in Workshop;
Tutorial 10: Pneumatic Logic Elements - 2 hrs (Tutorial problems available in Unit Moodle website)
Lab experiment on PLC and Pneumatic Control (2 hrs).

Assignment 3 (Laboratory Experiments and Report Submission) Due: Week 11 Monday (25 May 2020) 11:45 pm AEST

Week 12 - 01 Jun 2020

Module/Topic

Chapter

Events and Submissions/Topic

Lec 12: Review Lecture (2 hrs)

All sources mentioned above

Workshop on projects (2 hrs).
Tutorial 11: Pneumatic Control Circuits - 2 hrs (Tutorial problems available in Unit Moodle website)

Assignment 2 (Project 2) Due: Week 12 Monday (1 June 2020) 11:45 pm AEST

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

Term Specific Information

Students please note that, in T1 - 2020, due to non-availability of Lab staff member there will be no opportunity to perform lab experiments during the Weeks 5 to 7.

Assessment Tasks

1 Assignment 1 (Project 1)

Assessment Type

Written Assessment

Task Description

A team of four students will perform an engineering project work on a selected hydraulically operated and controlled industrial machine. In the project work students are supposed to design, calculate and analyse the projected machine. For design they will prepare estimation for selection and design of different components and units of the machine. The design will be presented primarily in manual sketches and then layout drawing and assembly drawing and part drawings of selected items using a CAD drawing software. Importance and scopes of industrial applications of the projected equipment and it's cost estimation are another factors. Control system for the designed machine students are supposed to use SimScape (MATLAB - Si,ulink) or FluidSim. On completion of the design project students are supposed to present their achievement in a workshop session.

Essential sections of Project 1 and the report are:

1. Title page (refer to template provided in Unit Moodle site)
2. Introduction and background (describe the problem of your selected project, demonstrate your understanding about the problem following available publications, mention the scope of application of the machine in industry, etc.);
3. Design layout/assembly drawing (2D/3D) in side view/s and top view, visualise it and get clear understanding of your projected machine, you may need to produce part drawings of the selected parts of your machine (selection can be done by your Tutor);
4. Sketch required fluid (hydraulic or pneumatic) power system, calculate and select required fluid (hydraulic or pneumatic) components for your project. You may need to start learning simulation using SimScape or FluidSim at this stage;
5. Industrial applications and value of your projected machine for engineering;
6. Safety factors that to be considered for operation of the projected machine;
7. List of References

Assessment Due Date

Week 6 Monday (20 Apr 2020) 11:45 pm AEST

Return Date to Students

Week 8 Monday (4 May 2020)

Weighting

20%

Minimum mark or grade

50%

Assessment Criteria

This team based project will be assessed considering both technical and professional aspects. The technical aspects cover a wide range of applications and quality of the design and analysis of a hydraulic and pneumatic systems, comparison and safety checking of the of the new design using proper engineering procedures. The professional aspects cover a higher level of teamwork, leadership, research, and communication skills. Further detail will be provided in due time via the Unit Moodle website.

Referencing Style

- [Vancouver](#)

Submission

Online Group

Submission Instructions

One submission for a group.

Learning Outcomes Assessed

- Design complex fluid drives and analyse their performance
- Evaluate advanced applications of drive systems in industrial plants
- Create professional documentation using terminology, symbols and diagrams related to electric and fluid drives.

Graduate Attributes

- Knowledge
- Communication
- Cognitive, technical and creative skills
- Research
- Self-management

2 Assignment 2 (Project 2)

Assessment Type

Written Assessment

Task Description

This project based assignment is based on the content covered in Weeks 1 to 12. The scope of the Assignment 2 will be populated in Week 7 via Unit Moodle website. This is a team work and group submission. Major content of the submission may cover Introduction, Literature finding, Design drawings and calculations, control circuit produced using SimScape (MATLAB-Simulink) or FluidSi, industrial importance and applications and cost estimation.

Essential sections of Project 2 and the report are:

1. Title page (refer to template provided in Unit Moodle site)

2. Introduction and background (describe the problem of your selected project, demonstrate your understanding about the problem following available publications, mention the scope of application of the machine in industry, etc.);
3. Design layout/assembly drawing (2D/3D) in side view/s and top view, visualise it and get clear understanding of your projected machine, you may need to produce part drawings of the selected parts of your machine (selection can be done by your Tutor);
4. Sketch required fluid (hydraulic or pneumatic) power system, calculate and select required fluid (hydraulic or pneumatic) components for your project. You may need to start learning simulation using SimScape or FluidSim at this stage;
5. Control strategy for the designed machine (schematics, pneumatic or hydraulic circuit, PLC program written to control the projected machine at least at a semi-automated level);
6. Industrial applications and value of your projected machine for engineering;
7. Safety factors that to be considered for operation of the projected machine;
8. List of references

Assessment Due Date

Week 12 Monday (1 June 2020) 11:45 pm AEST

Return Date to Students

Review/Exam Week Friday (12 June 2020)

Weighting

20%

Minimum mark or grade

50%

Assessment Criteria

This team-based project will be assessed considering both technical and professional aspects. The technical aspects cover a wide range of applications of design and analysis of a hydraulic and pneumatic system controlled by programmable controller's (PLCs), SimScape simulation, comparison and safety checking of the new design using proper engineering procedures. The professional skills cover a higher level of teamwork, leadership, research and communication skills. Students should refer to the Unit Moodle site for individual marking criteria of the team-based projects and labs. Detailed information will be provided in the Moodle website in time.

Referencing Style

- [Vancouver](#)

Submission

Online Group

Learning Outcomes Assessed

- Design fluid control circuits integrated with programmable controllers for automated machine systems
- Design protection and control systems for fluid power machines
- Analyse electro-mechanical power and energy conversion

Graduate Attributes

- Knowledge
- Cognitive, technical and creative skills
- Research

3 Assignment 3 (Laboratory Experiments and Report Submission)

Assessment Type

Laboratory/Practical

Task Description

Students in group will accomplish three lab experiments in hydraulic control and another three experiments in pneumatic control, pneumatic control integrated with PLCs. Students are supposed to demonstrate their professional and skillful attitude towards every experiments. Performances may include clear understanding of the objective, procedures and setup, capability of constructing the control circuits as required and finally running the experiments and collect information and data as required. Students are supposed to follow the OHS regulations.

Assessment Due Date

Week 11 Monday (25 May 2020) 11:45 pm AEST

Return Date to Students

Exam Week Monday (15 June 2020)

Weighting

20%

Minimum mark or grade

50%

Assessment Criteria

Assessment of lab experiments will be conducted in two phases: physically performing the experiments and submission of complete technical report on the performed experiment. Assessment criteria are based on detailed calculations and presentations of data obtained in the hydraulic and pneumatic setup. It is based on accuracy in calculations, validation of results obtained by proper interpretation of results. It is also based on the way how students are putting symbols and hydraulic/pneumatics diagrams to present sequence of operations in the experiments. More information will be provided in due time for individual experiment.

Referencing Style

- [Vancouver](#)

Submission

Online Group

Learning Outcomes Assessed

- Evaluate advanced applications of drive systems in industrial plants
- Design fluid control circuits integrated with programmable controllers for automated machine systems
- Design and analyse electro-mechanical and fluid control power and energy conversion systems
- Create professional documentation using terminology, symbols and diagrams related to electric and fluid drives.

Graduate Attributes

- Communication
- Ethical and Professional Responsibility

Examination

Outline

Complete an invigilated examination.

Date

During the examination period at a CQUniversity examination centre.

Weighting

40%

Length

120 minutes

Minimum mark or grade

50%

Exam Conditions

Closed Book.

Materials

Dictionary - non-electronic, concise, direct translation only (dictionary must not contain any notes or comments).

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