ENTM12006 *Industrial Fluid Power*
Term 1 - 2023

Profile information current as at 26/03/2023 10:08 pm

General Information

Overview

This unit will teach students about designing fluid power systems for automated and semi-automated industrial plants. You will be exploring fluid power elements and their ISO standard symbols, designing fluid power circuits using hydraulic and pneumatic actuators, power sources, directional control and other control valves, sensors and control systems. Control technology may include both hydraulic and pneumatic systems integrated with programmable controllers (PLCs and micro-controllers). During the mandatory residential school you will attain, in a team, hands-on skills in automation circuit design experiencing several laboratory experiments in areas of hydraulic and pneumatic operating system design and control circuit design integrated with PLCs for automated machines. Simulation systems like SimScape and FluidSim may be applied for confirming the functionality of your designed projects. You will communicate professionally using discipline-specific terminology to present designs and problem solutions accomplishing a Student Portfolio. Relevant problem solving, technical reports on projects and laboratory experiments are the formative assessment items during the Term. Online students are required to have access to a computer and internet to make frequent use of the Unit Moodle.

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

Prereq: ENAG11002 Energy & Electricity or ENEG11009 Fundamentals of Energy & Electricity or PHYS11185 Engineering Physics B
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 - 2023

- Mixed Mode

Attendance Requirements

All on-campus students are expected to attend scheduled classes – in some units, these classes are identified as a mandatory (pass/fail) component and attendance is compulsory. International students, on a student visa, must maintain a full time study load and meet both attendance and academic progress requirements in each study period (satisfactory attendance for International students is defined as maintaining at least an 80% attendance record).

Residential Schools

This unit has a Compulsory Residential School for distance mode students and the details are:
Click here to see your Residential School Timetable.

Website

This unit has a website, within the Moodle system, which is available two weeks before the start of term. It is important that you visit your Moodle site throughout the term. Please visit Moodle for more information.

Class and Assessment Overview

Recommended Student Time Commitment

Each 6-credit Undergraduate unit at CQUniversity requires an overall time commitment of an average of 12.5 hours of study per week, making a total of 150 hours for the unit.

Class Timetable

Regional Campuses
Bundaberg, Cairns, Emerald, Gladstone, Mackay, Rockhampton, Townsville

Metropolitan Campuses
Adelaide, Brisbane, Melbourne, Perth, Sydney

Assessment Overview

1. **Written Assessment**
Weighting: 30%
2. **Written Assessment**
Weighting: 40%
3. **Laboratory/Practical**
Weighting: 30%
4. **Written Assessment**
Weighting: Pass/Fail

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 Evaluation feedback

Feedback

More organised, on weekly basis, learning materials in the Moodle site.

Recommendation

Suggested to organise and sort out, more appropriately making easy-accessible, all learning and assessment materials at the beginning of the term.

Feedback from UC reflection and students' wish

Feedback

Sourcing and using automation industry simulation software (free for students) to test their designed fluid circuit prior to lab experiments.

Recommendation

Recommended continuing sourcing fluid circuit simulation software (complimentary) from prominent industrial automation companies assisting students to use it for their tutorial and lab experiments.

Unit Learning Outcomes

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

1. Explain and analyse the design and working principles of fluid power system elements
2. Select appropriate sizes of fluid power components to achieve functional objectives of fluid machineries
3. Design suitable pressure control to protect circuit components and to minimise energy loss for sustainability
4. Design and draw simple pneumatic/hydraulic circuits for automation of machine systems
5. Work, learn and communicate in an ethical, professional manner individually and collaboratively, using information literacy skills to investigate problems and present solutions.

The Learning Outcomes for this unit are linked with the Engineers Australia Stage 1 Competency Standards for Engineering Associates in the areas of 1. Knowledge and Skill Base, 2. Engineering Application Ability and 3. Professional and Personal Attributes at the following levels:

Introductory

2.4 Application of systematic project management processes. (LO: 3N)

Intermediate

1.1 Descriptive, formula-based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the practice area. (LO: 1I 3I)

1.2 Procedural-level understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the practice area. (LO: 2I 3I)

2.2 Application of technical and practical techniques, tools and resources to well-defined engineering problems. (LO: 1N 2I 4I)

3.2 Effective oral and written communication in professional and lay domains. (LO: 1N 2I 4I 5I)

3.5 Orderly management of self, and professional conduct. (LO: 1I 2I 3I 4I)

Advanced

1.3 In-depth practical knowledge and skills within specialist sub-disciplines of the practice area. (LO: 1I 2A 3I 4A)

1.4 Discernment of engineering developments within the practice area. (LO: 1A 2A 3A 4A)

1.5 Knowledge of engineering design practice and contextual factors impacting the practice area. (LO: 1I 3A 4I)

1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the area of practice. (LO: 2I 3I 4A 5N)

2.1 Application of established technical and practical methods to the solution of well-defined engineering problems. (LO: 1I 3A)

2.3 Application of systematic design processes to well-defined engineering problems. (LO: 2A 3A 4A)

3.1 Ethical conduct and professional accountability. (LO: 2N 3N 4A 5I)

3.3 Creative, innovative and pro-active demeanour. (LO: 1I 2A 3A 4A 5I)

3.4 Professional use and management of information. (LO: 3A 4A 5N)

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

— 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	5
1 - Written Assessment - 30%	•	•			
2 - Written Assessment - 40%		•		•	•
3 - Laboratory/Practical - 30%			•	•	•
4 - Written Assessment - 0%	•		•		

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes				
	1	2	3	4	5
1 - Communication	◦	•		•	•
2 - Problem Solving		•	•	•	•
3 - Critical Thinking	◦	•	◦	•	
4 - Information Literacy	•			•	
5 - Team Work		•			
6 - Information Technology Competence		•		•	•
7 - Cross Cultural Competence					
8 - Ethical practice			◦		◦
9 - Social Innovation					
10 - Aboriginal and Torres Strait Islander Cultures					

Textbooks and Resources

Textbooks

ENTM12006

Prescribed

Introduction to Fluid Power
1st edition
Authors: James L. Johnson
Cengage Learning
Florence , KY , USA
ISBN: 9780766823655
Binding: Paperback

Additional Textbook Information
Textbooks can be accessed online at the CQUniversity Library website. If you prefer your own copy, you can purchase either paper or eBook versions at 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)
- Hardware to access audio-visual clips

Referencing Style

All submissions for this unit must use the referencing styles below:

- Vancouver
- Harvard (author-date)

For further information, see the Assessment Tasks.

Teaching Contacts

Abdul Mazid Unit Coordinator
a.mazid@cqu.edu.au

Schedule

Week 1: Fluid properties - 06 Mar 2023

Module/Topic	Chapter	Events and Submissions/Topic
Lec 1: Fluid Properties and Principles (1 hr) (Lecture hours are dedicated to theories and analysis)	2	Tutorial 1: Characteristics of hydraulic fluid (1 hr) (Tutorial hours dedicated to problem solving)

Week 2: Hydraulic pumps - 13 Mar 2023

Module/Topic	Chapter	Events and Submissions/Topic
Lec 2: Hydraulic Pumps - Design construction and performances (1 hr)	3	Tutorial 2: Characteristics of fluid pumps (1 hr)

Week 3: Actuators linear - 20 Mar 2023

Module/Topic	Chapter	Events and Submissions/Topic
Lec 3: Fluid Cylinders - Linear actuators (1 hr)	4	Tutorial 3: Analysis, sizing and selection of actuators (1 hr)

Week 4: Actuators rotary - 27 Mar 2023

Module/Topic	Chapter	Events and Submissions/Topic
Lec 4: Hydraulic Motors - Rotary actuators - design construction and performances (1 hr)	5	Tutorial 4: Hydraulic motor sizing and Selection (1 hr)

Week 5: Control valves - 03 Apr 2023

Module/Topic	Chapter	Events and Submissions/Topic
Lec 5: Hydraulic Control Valves and DCVs (1 hr)	6	Tutorial 5: Valve design construction and performances (1 hr)

Vacation Week - 10 Apr 2023

Module/Topic	Chapter	Events and Submissions/Topic
No lecture or tutorial classes. Work on completion of Assignment		Revisit all learning materials delivered in Weeks 1 to 5. Consultation on request via Zoom.

Week 6: Pressure control - 17 Apr 2023

Module/Topic	Chapter	Events and Submissions/Topic
Lec 6: Fluid Control Circuit Design; Pressure Control Devices	7	Tutorial 6: Design and working principles of pressure control valves (1 hr) **Assignment one: Fluid power** Due: Week 6 Monday (17 Apr 2023) 12:00 am AEST

Week 7: Flow control - 24 Apr 2023

Module/Topic	Chapter	Events and Submissions/Topic
Lec 7: Flow Control Units in Fluid Control Systems; Flow Control Devices	8	Tutorial 7: Fluid Control Circuit Design (1 hr) Guest lecture on PLC programming (TBA)

Week 8: Pneumatic Logic Elements - 01 May 2023

Module/Topic	Chapter	Events and Submissions/Topic
Lec 8: Pneumatic Control Elements	12 and Handout	Tutorial 8: Design construction and performances of pneumatic control elements (1 hr)

Week 9: Pneumatic control Circuit - 08 May 2023

Module/Topic	Chapter	Events and Submissions/Topic
Lec 9: Pneumatic Logic Elements and Control Circuits	12 and Handout	Tutorial 9: Working principles of Pneumatic Control Elements **Residential School - Virtual mode** (delivered from Melbourne Campus via Zoom): Tuesday - Wednesday Week 9.

Week 10: PLCs - 15 May 2023

Module/Topic	Chapter	Events and Submissions/Topic
Lec 10: PLC Architecture and Programming	Handout & Esposito Ch 15	Tutorial 10: Design and working principles of Pneumatic Logic Elements; Guest Lecture: PLC Programming

Week 11: Electric control - 22 May 2023

Module/Topic	Chapter	Events and Submissions/Topic

Lec 11: Electric Control of Fluid Systems (1 hr)	13 and Handout Materials	Tutorial 11:Examples of PLC programs for Pneumatic Control Systems **Assignment Two: Fluid Systems** Due: Week 11 Monday (22 May 2023) 12:00 am AEST

Week 12: Ancillary components - 29 May 2023

Module/Topic	Chapter	Events and Submissions/Topic
Lec 12: Maintenance of Fluid Systems	9	Tutorial 12: Characteristics of hydraulic ancillary components **Lab experiments: Fluid system design** Due: Week 12 Wednesday (31 May 2023) 12:00 am AEST **Workbook** Due: Week 12 Friday (2 June 2023) 12:00 am AEST

Review/Exam Week - 05 Jun 2023

Module/Topic	Chapter	Events and Submissions/Topic

Exam Week - 12 Jun 2023

Module/Topic	Chapter	Events and Submissions/Topic

Assessment Tasks

1 Assignment one: Fluid power

Assessment Type
Written Assessment

Task Description
Assignment 1 involves problem solving and analysis of hydraulic drive and control systems of industrial machines. This assignment covers learning materials for Weeks 1 to 4. This may involve fluid system circuit design for a selected industrial automated or semi-automated machine.

Assessment Due Date
Week 6 Monday (17 Apr 2023) 12:00 am AEST
Upload one pdf document, include title page.

Return Date to Students
Week 8 Tuesday (2 May 2023)
Expected, marked assignments to be returned after two weeks of submission date.

Weighting
30%

Minimum mark or grade
50%

Assessment Criteria
Each question in this assignment will be assessed separately for the criterion accuracy and correct results.
20% of the total marks for this assignment are based on accuracy and correct results, including:

- Correct application of maths and arithmetic
- Accuracy and quality of hydraulic circuit
- Answers clearly identified
- Correct results

In addition, the assignment, as a whole, will be assessed against the following criteria:
Evidence of correct procedures (40% of the total marks for the assignment)

- All necessary steps in analysis are present in correct order
- Clear presentation of mathematical and arithmetical works linking the given details of the problem to obtain the results.

Evidence of understanding of the topic (30% of the total marks for the assignment)

- Explanation of choices made in the analysis
- Interpretation of results, eg limitations etc, if any.

Professional presentation (10% of the total marks for the assignment)

- Assignment title page indicating assignment detail and student detail
- The problem is clearly identified
- Clear statement of each problem and its details and requirements
- Logical layout of analysis
- Appropriate use of diagrams and ISO standard, units, neatness of diagrams
- Correct use of terminology and conventions
- Scan quality, if used, must be high quality

Referencing Style

- Vancouver
- Harvard (author-date)

Submission
Online

Submission Instructions
It is not expected that students will type up calculations. Students should scan (high quality) hand calculations for online submission. Title sheet is essential.

Learning Outcomes Assessed

- Explain and analyse the design and working principles of fluid power system elements
- Select appropriate sizes of fluid power components to achieve functional objectives of fluid machineries

2 Assignment Two: Fluid Systems

Assessment Type
Written Assessment

Task Description
The assignment covers the weekly topics 5-8. The assignment tasks and questions will be uploaded on the course website by the end of week 5. In this assessment item, students are required to answer problem solving and numerical questions. Hydraulic / pneumatic circuit design for an industrial machine may be other part of this assignment.

Assessment Due Date
Week 11 Monday (22 May 2023) 12:00 am AEST

Return Date to Students
Review/Exam Week Friday (9 June 2023)
Expected, marked assignments to be returned after two weeks of submission date.

Weighting
40%

Minimum mark or grade
50%

Assessment Criteria
Each question in this assignment will be assessed separately for the criterion accuracy and correct results.
20% of the total marks for this assignment are based on accuracy and correct results, including:

- Correct application of maths and arithmetic
- Presenting functional and accurate control circuit for automated or semi-automated industrial machine
- Answers clearly identified
- Use of relevant ISO standard
- Correct results

In addition, the assignment, as a whole, will be assessed against the following criteria:
Evidence of correct procedures (40% of the total marks for the assignment)

- All necessary steps in analysis are present on correct order
- Clear presentation of mathematical and arithmetical working linking given details of the problem to the results obtained.

Evidence of understanding of the topic (30% of the total marks for the assignment)

- Explanation of choices made in the analysis
- Interpretation of results, eg limitations etc, if any.

Professional presentation (10% of the total marks for the assignment)

- The problem is clearly identified
- Clear statement of each problem and its details and requirements
- Logical layout of analysis
- Appropriate use of diagrams, units, clear diagrams
- Correct use of terminology, ISO symbols and conventions
- A title page indicating assignment detail and student detail
- High quality scan, if used

Referencing Style

- Vancouver
- Harvard (author-date)

Submission
Online

Submission Instructions
It is not expected that students will type up calculations. Students should scan (high quality) hand calculations for online submission.

Learning Outcomes Assessed

- Select appropriate sizes of fluid power components to achieve functional objectives of fluid machineries
- Design and draw simple pneumatic/hydraulic circuits for automation of machine systems
- Work, learn and communicate in an ethical, professional manner individually and collaboratively, using information literacy skills to investigate problems and present solutions.

3 Lab experiments: Fluid system design

Assessment Type
Laboratory/Practical

Task Description
Lab experiments are major part of two-day residential school in ENTM12006.
Students in group will accomplish three lab experiments (in day one) in hydraulic control and another three experiments (in day two) in pneumatic control. 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. A group report of each experiment is an essential part of assessment. Students are supposed to follow the OHS regulations.

Assessment Due Date
Week 12 Wednesday (31 May 2023) 12:00 am AEST

Return Date to Students
Exam Week Friday (16 June 2023)
Results to be shown up in grade certification

Weighting
30%

Minimum mark or grade
50%

Assessment Criteria

Assessment of lab experiments will consist of two phases: physically performing the experiments in group and submission of complete technical report (individual) on the performed experiments.

Assessment criteria are based on:

1) Detailed calculations and presentations of data required for setting up the hydraulic/pneumatic

equipment.

2) How accurately the students are using ISO symbols to construct hydraulic/pneumatic circuit diagrams to present sequence of operations in the experiments.

3) Expected content of lab report may contain a title page indicating experiment detail and group member detail, labelled sketch of set-up used, data sheet and result with a short comment section.

More particular information will be provided in due time for individual experiment.

Referencing Style

- Vancouver
- Harvard (author-date)

Submission
Online

Submission Instructions
Reports of all experiments together in one pdf document, include title page.

Learning Outcomes Assessed

- Design suitable pressure control to protect circuit components and to minimise energy loss for sustainability
- Design and draw simple pneumatic/hydraulic circuits for automation of machine systems
- Work, learn and communicate in an ethical, professional manner individually and collaboratively, using information literacy skills to investigate problems and present solutions.

4 Workbook

Assessment Type
Written Assessment

Task Description
The Workbook provides a record or detailed diary of each individual student's study and learning activities throughout the course and should include all individual work carried out. Preparation of a Workbook should be understood as good study technique. It also provides evidence that students have adequately studied the whole course and achieved course learning outcomes. Each entry should be dated, pages should be numbered and show your name or initials. It should be prepared week by week, not at the end of term. Show rough attempts at problems including failures and fixes, brainstorming, draft notes and developing ideas. In the Workbook students should record:

- study notes taken while studying textbooks and course resources
- study notes taken during lectures and/or workshops
- personal study summaries of key concepts
- notes, sketches/ drawings or mind-maps
- planning and preparation for team/project tasks
- planning and preparation for online course discussions
- workbook practice tasks you are asked to complete in the Course Website
- initial attempts at set tutorial tasks
- initial attempts at assignment tasks
- preparation for class tests or exams.

Assessment Due Date
Week 12 Friday (2 June 2023) 12:00 am AEST

Return Date to Students
Exam Week Friday (16 June 2023)
Pass/Fail result showing up in the grade finalisation

Weighting
Pass/Fail

Minimum mark or grade
50%

Assessment Criteria
Workbook questions will be set for each topic and will be available on the Course Website. If students have difficulty with Workbook questions, they should seek assistance. All questions must be successfully completed in the workbook and responses must show sufficient working and explanation to allow step-by-step checking by the marker. At least 50% of

the questions must be completed to achieve a passing grade. A question will be deemed to have been completed if the student has shown correct procedure and sound understanding of the work. All calculations should be justified with reference to the text or relevant Standards and Codes.

Referencing Style

- Vancouver
- Harvard (author-date)

Submission
Online

Submission Instructions
It is not expected that students will type up calculations. Students should scan (high quality) hand calculations for online submission.

Learning Outcomes Assessed

- Explain and analyse the design and working principles of fluid power system elements
- Design suitable pressure control to protect circuit components and to minimise energy loss for sustainability

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