ENEE13019 *Control Systems Analysis and Design*
Term 2 - 2024

Profile information current as at 01/07/2025 09:36 am

General Information

Overview
Automatic control systems are fundamental to our way of life, including electrical power, electronics, automation and robotics. In this unit, you will work individually and also in teams to model, analyse, and investigate design options for analogue and digital control systems. You will articulate typical control systems building blocks and select appropriate components and interfaces for specific applications. In addition, you will develop mathematical models to analyse the behaviour of selected dynamic systems and design their controllers. You will apply simulation software to analyse and simulate the control systems. This unit will provide you with the opportunities to practice your communication skills through developing technical documentation and reports. All students must have access to a computer, frequently use the Internet, and complete the compulsory practical activities. Furthermore, the unit also aims to promote the UN sustainable development Goal 9 - Build resilient infrastructure, promote inclusive and sustainable industrialisation, and foster innovation by developing an understanding of how to build resilient and sustainable automation and intelligence systems to support industrial innovation.

Details
Career Level: *Undergraduate*
Unit Level: *Level 3*
Credit Points: *6*
Student Contribution Band: *8*
Fraction of Full-Time Student Load: *0.125*

Pre-requisites or Co-requisites
Prerequisites: (ENEE13020 Digital Electronics or ENEX12002 Introductory Electronics) and ENEE12016 Signals and Systems.
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 - 2024

- 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 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. **Online Quiz(zes)**
Weighting: 30%
2. **Written Assessment**
Weighting: 40%
3. **Laboratory/Practical**
Weighting: 30%

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 SUTE

Feedback
The unit content is highly appreciated. Also appreciated is the clear explanations provided on every topic.

Recommendation
This good practice should be continued.

Feedback from SUTE

Feedback
The support provided to students by the teaching staff has been commended.

Recommendation
This good practice should be continued.

Feedback from SUTE

Feedback
Better quality learning material must be provided (eg. Lecture slides without annotations).

Recommendation
The quality of learning material should be improved.

Feedback from SUTE

Feedback
Extensive feedback expected for Laboratory experiment based assignment.

Recommendation
Detailed Feedback should be given to Laboratory experiment based assignments.

Unit Learning Outcomes

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

1. Apply the principles of automatic control systems including associated control system building blocks
2. Examine the principles and applications of sensors, amplifiers, controllers, and associated elements in analogue and digital control systems
3. Analyse behavioural models of dynamic systems and controllers using appropriate mathematical, graphical and computer-aided tools
4. Investigate controller design for a dynamic system collaboratively and autonomously
5. Document control system solutions, calculations using correct terminology, symbols and diagrams.

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:

Intermediate 1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline. (LO: 1I 2I 3I) 1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline. (LO: 1I 2I 3I) 3.2 Effective oral and written communication in professional and lay domains. (LO: 5I 6I) 3.6 Effective team membership and team leadership. (LO: 5I)

Advanced 1.1 Comprehensive, theory-based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline. (LO: 1A 2A 3A) 1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline. (LO: 1A 2A 3A) 1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline. (LO: 1A 2A 3A) 1.4 Discernment of knowledge development and research directions within the engineering discipline. (LO: 1I 2A 3A) 2.1 Application of established engineering methods to complex engineering problem solving. (LO: 1A 2A 3A)

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 informationhttps://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 - Online Quiz(zes) - 30%	•	•	•		
2 - Written Assessment - 40%	•	•	•	•	•
3 - Laboratory/Practical - 30%				•	•

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

ENEE13019

Prescribed

Control Systems Engineering
Edition: 8th edn or later
Authors: Nise, N.S.
John Wiley & Sons
Hoboken , NJ , USA
ISBN: 978-1-118-17051-9
Binding: Paperback

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

Sanath Alahakoon Unit Coordinator
s.alahakoon@cqu.edu.au

Schedule

Week 1 - 08 Jul 2024

Module/Topic	Chapter	Events and Submissions/Topic
Introduction to Control Systems	Chapter 1: Introduction Week 1 Study Guide	

Week 2 - 15 Jul 2024

Module/Topic	Chapter	Events and Submissions/Topic
Representation of control systems	Chapter 2: Modeling in the Frequency Domain Chapter 5: Reduction of Multiple Subsystems Week 2, 3 Study Guide	

Week 3 - 22 Jul 2024

Module/Topic	Chapter	Events and Submissions/Topic
Representation of control systems	Chapter 2: Modeling in the Frequency Domain Chapter 5: Reduction of Multiple Subsystems Week 2, 3 Study Guide	

Week 4 - 29 Jul 2024

Module/Topic	Chapter	Events and Submissions/Topic
Poles, zeros and the system response	Chapter 4: Time Response Chapter 7: Steady-State Errors Week 4, 5 Study Guide	**Online Quiz Part 1** (Open from 29th July - 04th August 2024)

Week 5 - 05 Aug 2024

Module/Topic	Chapter	Events and Submissions/Topic
Poles, zeros and the system response	Chapter 4: Time Response Chapter 7: Steady-State Errors Week 4, 5 Study Guide	

Vacation Week - 12 Aug 2024

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 19 Aug 2024

Module/Topic	Chapter	Events and Submissions/Topic
Stability	Chapter 6: Stability	**Online Quiz Part 2** (Open from 19th August - 25th August 2024)

Week 7 - 26 Aug 2024

Module/Topic	Chapter	Events and Submissions/Topic
Overview of Digital Control	Chapter 13: Digital Control Systems Week 7 Study Guide	**Lab session for GLD & MKY from 26/08/2024 to 28/08/2024 Online/Mixed mode student may opt to join this session.**

Week 8 - 02 Sep 2024

Module/Topic	Chapter	Events and Submissions/Topic
PID Control and State Space Design Techniques	Week 8 Study Guide	**Lab session for BDG,ROK,& CNS from 02/09/2024 to 04/09/2024. Online/Mixed mode student may opt to join this session.**

Week 9 - 09 Sep 2024

Module/Topic	Chapter	Events and Submissions/Topic
Root Locus Based Controller Design	Chapter 8: Root Locus Techniques Chapter 9: Design Via Root Locus Week 9, 10 Study Guide	**Online Quiz Part 3** (Open from 9th September - 15th September 2024)

Week 10 - 16 Sep 2024

Module/Topic	Chapter	Events and Submissions/Topic
Root Locus Based Controller Design	Chapter 8: Root Locus Techniques Chapter 9: Design Via Root Locus Week 9, 10 Study Guide	

Week 11 - 23 Sep 2024

Module/Topic	Chapter	Events and Submissions/Topic
Frequency Response Based Controller Design	Chapter 10: Frequency Response Techniques Chapter 11: Design Via Frequency Response Week 11 Study Guide	**Laboratory Exercises Based Report** Due: Week 11 Friday (27 Sept 2024) 11:55 pm AEST

Week 12 - 30 Sep 2024

Module/Topic	Chapter	Events and Submissions/Topic
Industrial Control Systems - PLCs and SCADA and Unit Review	Week 12 Study Guide	**Online Quiz Part 4** (Open from 30th September - 06th October 2024)

Review/Exam Week - 07 Oct 2024

Module/Topic	Chapter	Events and Submissions/Topic
Topic Review: Students (No timetabled session)		**Project-Based Learning Assessment** Due: Review/Exam Week Friday (11 Oct 2024) 11:55 pm AEST

Exam Week - 14 Oct 2024

Module/Topic	Chapter	Events and Submissions/Topic

Term Specific Information

Students require to use MATLAB/SIMULINK software for this unit. CQUniversity licensed version can be downloaded and installed free of charge from https://au.mathworks.com/ by setting up and account using your CQUniversity student email ID. Recommended downloading the full version including all toolboxes.

Assessment Tasks

1 ONLINE QUIZZES

Assessment Type
Online Quiz(zes)

Task Description
There are 4 online quizzes which gives 30% of the unit total. Marks for the three quizzes will be averaged and scaled to a mark out of 30%. This collection of online quizzes will be published in the unit Moodle site. Online quizzes are designed to check the essential student understanding of each of the topics covered in the unit. The quizzes will be available in Week 4, 6, 9, and 12. Each quiz will test the knowledge gained by the students during the weeks immediately before the particular quiz. Each quiz will allow 3 attempts and the highest mark obtained will be counted for finalising the gradebook.

Number of Quizzes
4

Frequency of Quizzes

Assessment Due Date

Completed online through unit Moodle site. Please refer to unit schedule and Assessment tile in Moodle for more details.

Return Date to Students

Students will have access to the results immediately after the quizzes

Weighting
30%

Minimum mark or grade
Students must score 50% of the allocated marks.

Assessment Criteria
Students can have up to three attempts. Highest mark/s will be counted. Each correct response will receive one mark. Marks for the four quizzes will be averaged and scaled to a mark out of 30%.

Referencing Style

- Harvard (author-date)

Submission
No submission method provided.

Learning Outcomes Assessed

- Apply the principles of automatic control systems including associated control system building blocks
- Examine the principles and applications of sensors, amplifiers, controllers, and associated elements in analogue and digital control systems
- Analyse behavioural models of dynamic systems and controllers using appropriate mathematical, graphical and computer-aided tools

2 Project-Based Learning Assessment

Assessment Type
Written Assessment

Task Description
This Project-Based Learning Assessment will keep the students engaged with all theoretical knowledge they gain throughout the 12 week term by applying the knowledge to solve various sub-problems related to the project. Projects will be assigned in the initial part of the term (eg. Week 3 or 4). The students will keep working out different exercises within the project as they gin knowledge on various analytical skills they are supposed to learn/gain on control system analysis and design as they progress through the learning content. More details on the Project-Based Learning Assessment will be provided in the unit Moodle site.

Assessment Due Date
Review/Exam Week Friday (11 Oct 2024) 11:55 pm AEST

Submit to the link in the unit website in Moodle as a WORD or PDF file.

Return Date to Students
Exam Week Friday (18 Oct 2024)

Feedback given through unit website in Moodle

Weighting
40%

Minimum mark or grade
Students must score 50% of the allocated marks.

Assessment Criteria
Marking of the Project-Based Learning Assessment will be done according to the following criteria.
Application of knowledge
Correct theoretical derivations.
The accuracy and relevance of information
Language and grammar used in answering questions
Proper referencing of sources of information
Inclusion of all relevant Equations, images, data and tables, and the quality of presentation and layout.
Referencing

Referencing Style

- Harvard (author-date)

Submission
No submission method provided.

Learning Outcomes Assessed

- Apply the principles of automatic control systems including associated control system building blocks
- Examine the principles and applications of sensors, amplifiers, controllers, and associated elements in analogue and digital control systems
- Analyse behavioural models of dynamic systems and controllers using appropriate mathematical, graphical and computer-aided tools
- Investigate controller design for a dynamic system collaboratively and autonomously
- Document control system solutions, calculations using correct terminology, symbols and diagrams.

3 Laboratory Exercises Based Report

Assessment Type
Laboratory/Practical

Task Description
Dates for the compulsory residential school will be notified to students through residential school calendar and the unit Website. Students are expected to submit a pre-lab preparation report prior to attending the residential school. Requirements for the will be notified through the unit Moodle site.
Students will be formed into teams for all residential school activities and each team must submit professional technical laboratory reports compiled into one Zipped file covering each laboratory experiment they will carry out during the residential school. One submission per team is sufficient. The details of the experiments will be notified to students through the unit Website. Please also refer to assessment criteria for more details. 30% allocated for Laboratory

Exercises Based Report will be a combination of the marks obtained for the individual pre-lab preparation report (10%) and team lab report (20%).

Assessment Due Date
Week 11 Friday (27 Sept 2024) 11:55 pm AEST

Submit to the link in the unit website in Moodle as a WORD or PDF file.

Return Date to Students
Review/Exam Week Friday (11 Oct 2024)

Feedback given through unit website in Moodle

Weighting
30%

Assessment Criteria
This is a combination of an individual assessment and a team assessment.
Individual Assessment: pre-lab preparation report (10%)
Marking of the team reports will be done according to the following criteria.

- Application of knowledge
- Correct theoretical derivations.
- The accuracy and relevance of information
- Language and grammar used in answering questions

Team Assessment: Team lab report (20%)
Marking of the team reports will be done according to the following criteria.

- The accuracy and relevance of information
- Application of knowledge
- Language and grammar used in answering questions
- Proper referencing of sources of information
- Inclusion of all relevant Equations, images, data and tables, and the quality of presentation and layout.
- Referencing

Referencing Style

- Harvard (author-date)

Submission
No submission method provided.

Learning Outcomes Assessed

- Investigate controller design for a dynamic system collaboratively and autonomously
- Document control system solutions, calculations using correct terminology, symbols and diagrams.

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