



ENEX13001 *Instrumentation and Industrial Automation*

Term 2 - 2020

Profile information current as at 18/04/2024 06:52 pm

All details in this unit profile for ENEX13001 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 will introduce you to the fundamentals of industrial instrumentation and automation systems. You will learn the principles of operation of different sensors, actuators, instrumentation amplifiers, and industrial data communication busses. You will also learn noise cancellation and signal conditioning, sensor and actuator interfacing, programmable logic controller (PLC) programming, and process control. You will learn how to specify the requirements for sensors, actuators, and control equipment for a given task, evaluate multiple options available, and select the best combination of them for your design. You will also design, fabricate, and program production lines for a given product using industry standard components and PLCs. You will carry out product line programming using a simulated software environment.

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: ENEX12002 Introductory Electronics OR (ENEE13018 Analogue Electronics & ENEE13020 Digital 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 - 2020

- Mackay
- Online

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. **Written Assessment**

Weighting: 20%

2. **Written Assessment**

Weighting: 20%

3. **Practical Assessment**

Weighting: 20%

4. **Take Home Exam**

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 survey

Feedback

The labs with MPS systems were very interesting and relevant.

Recommendation

The Laboratory experiments will be the same for future offerings.

Feedback from Student survey

Feedback

PLC programming is a valuable skill developed through this unit.

Recommendation

The Laboratory experiments with PLC programming will be the same for future offering.

Feedback from Student survey

Feedback

It would be helpful if more guidance is provided for laboratory report writing.

Recommendation

More specific guidelines will be provided about the laboratory report writing.

Unit Learning Outcomes

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

1. Describe the need for instrumentation amplifiers in an instrumentation system and their operation
2. Apply common industrial data bus protocols and use them in data acquisition and control programs
3. Specify requirements for sensors, actuators, and accessories for a given process automation module, and select suitable components from a range of available options
4. Program industrial PLCs to provide real-time solutions for industrial automation problems
5. Implement complete solutions for industrial process automation problems
6. Solve real life problems and communicate professionally using instrumentation engineering terminology, symbols and diagrams that conform to Australian and international standards
7. Work individually and collaboratively in teams, communicate professionally in presenting your solutions.

Learning outcomes are linked to Engineers Australia Stage 1 Competencies and also discipline capabilities. You can find the mapping for this on the [Engineering Undergraduate Course website](#).

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%	•				•		•

Assessment Tasks	Learning Outcomes						
	1	2	3	4	5	6	7
2 - Written Assessment - 20%		•	•	•	•	•	•
3 - Practical Assessment - 20%		•	•	•	•	•	•
4 - Take Home Exam - 40%	•						

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes						
	1	2	3	4	5	6	7
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							

Alignment of Assessment Tasks to Graduate Attributes

Assessment Tasks	Graduate Attributes									
	1	2	3	4	5	6	7	8	9	10
1 - Written Assessment - 20%	•	•	•			•				
2 - Written Assessment - 20%	•	•	•			•				
3 - Practical Assessment - 20%	•	•	•		•	•		•		
4 - Take Home Exam - 40%	•	•	•			•		•		

Textbooks and Resources

Textbooks

ENEX13001

Prescribed

Principles of Measurement Systems

Edition: 4th (2005)

Authors: John P Bentley

Pearson Education Ltd.

Harlow , Essex , England

ISBN: 0-130-43028-5

Binding: Paperback

Additional Textbook Information

If you prefer to study with a paper copy, they are available at the CQUni Bookshop here: <http://bookshop.cqu.edu.au> (search on the Unit code). eBooks are available at the publisher's website.

[View textbooks at the CQUniversity Bookshop](#)

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- A portable computer with Windows 7 or later with Admin authority to install CoDeSys and other required software
- Access to a document scanner and a software that can create pdf documents

Referencing Style

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

For further information, see the Assessment Tasks.

Teaching Contacts

Preethi Preethichandra Unit Coordinator

d.preethichandra@cqu.edu.au

Schedule

Week 1 - 13 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
• Introduction to measurement systems, static characteristics, and accuracy of measurements	• CH 1 • CH 2 • CH 3	

Week 2 - 20 Jul 2020

Module/Topic	Chapter	Events and Submissions/Topic
• Operational amplifiers in instrumentation systems	• Lecture notes / slides	

Week 3 - 27 Jul 2020

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

- Introduction to Industrial Automation
- Fundamentals of Pneumatic System Elements
- Lecture notes/ Slides

Week 4 - 03 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
• PLC Programming Fundamentals	• Lecture notes/ Slides	

Week 5 - 10 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
• Signal Conditioning Elements	• CH 9 • Lecture notes/Slides	

Vacation Week - 17 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 24 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
• Loading Effects in Two-port Networks	• CH 5	Assignment 1 Due: Week 6 Friday (28 Aug 2020) 11:55 pm AEST

Week 7 - 31 Aug 2020

Module/Topic	Chapter	Events and Submissions/Topic
• Signals and Noise in Measurement Systems • Four Terminal Measurements and Source-Measure Units in Instrumentation Systems	• Ch 6 • Lecture notes/ Slides	

Week 8 - 07 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
• Two-Port network parameters • Data Acquisition and Communications Systems • Industrial Data Communications Protocols	• Lecture notes/ Slides • CH18	

Week 9 - 14 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
• Industrial Instrumentation Busses and their Applications	• Lecture notes/ Slides	

Week 10 - 21 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
• Industrial Process Control Systems	• Lecture notes/ Slides	Residential School 23-25 September Assignment 2 Due: Week 10 Friday (25 Sept 2020) 11:55 pm AEST

Week 11 - 28 Sep 2020

Module/Topic	Chapter	Events and Submissions/Topic
• Sensing Elements • Ultrasonic Measurement Systems • Flow Measurement Systems	• Ch 8 • CH 16 • CH 12	Laboratory Exercises - Practical and Written Assessment Due: Week 11 Wednesday (30 Sept 2020) 11:55 pm AEST

Week 12 - 05 Oct 2020

Module/Topic	Chapter	Events and Submissions/Topic
• Parasitic Elements in Measurement Systems • Optical Measurement Systems	• CH 14 • CH 15	

Review/Exam Week - 12 Oct 2020

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

Exam Week - 19 Oct 2020

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

Term Specific Information

Due to COVID-19 situation the Res-School will **not be** held in face-to-face mode and it will be replaced by an online activity. However, the res-school schedule will not be changed and all students (on-campus and MIX mode) will be attending the res-school together. There will not be any weekly practical sessions for on-campus students. The examination is replaced by a Take Home Examination.

Assessment Tasks

1 Assignment 1

Assessment Type

Written Assessment

Task Description

This assignment is based on instrumentation principles and application of them in actual measurement systems. Further details will be available on the unit moodle site.

Assessment Due Date

Week 6 Friday (28 Aug 2020) 11:55 pm AEST

Return Date to Students

Week 9 Monday (14 Sept 2020)

Marked assignment with feedback will be provided.

Weighting

20%

Assessment Criteria

Marks will be allocated for the following things:

1. Application of theoretical fundamentals.
2. Correct diagrams using standard notations.
3. Explanation of reasons to apply specific theory to solve a given problem where applicable.
4. Correct mathematical working and correct answer.
5. All working must be shown to obtain full marks
6. Neatness and format.

Referencing Style

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

Submission

Online

Submission Instructions

single pdf file

Learning Outcomes Assessed

- Describe the need for instrumentation amplifiers in an instrumentation system and their operation
- Implement complete solutions for industrial process automation problems
- Work individually and collaboratively in teams, communicate professionally in presenting your solutions.

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Technology Competence

2 Assignment 2

Assessment Type

Written Assessment

Task Description

This assignment is based on advanced measurement techniques and fundamentals of industrial automation systems.

Assessment Due Date

Week 10 Friday (25 Sept 2020) 11:55 pm AEST

Return Date to Students

Week 12 Friday (9 Oct 2020)

Marked assignment with feedback will be provided.

Weighting

20%

Assessment Criteria

Marks will be allocated for the following things:

1. Application of theoretical fundamentals.
2. Correct diagrams using standard notations.
3. Explanation of reasons to apply specific theory to solve a given problem where applicable.
4. Correct mathematical working and correct answer.
5. All working must be shown to obtain full marks
6. Neatness and format.

Referencing Style

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

Submission

Online

Learning Outcomes Assessed

- Apply common industrial data bus protocols and use them in data acquisition and control programs
- Specify requirements for sensors, actuators, and accessories for a given process automation module, and select suitable components from a range of available options
- Program industrial PLCs to provide real-time solutions for industrial automation problems
- Implement complete solutions for industrial process automation problems
- Solve real life problems and communicate professionally using instrumentation engineering terminology, symbols and diagrams that conform to Australian and international standards
- Work individually and collaboratively in teams, communicate professionally in presenting your solutions.

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Technology Competence

3 Laboratory Exercises - Practical and Written Assessment

Assessment Type

Practical Assessment

Task Description

This task involves laboratory experiments on industrial automation and instrumentation (due to COVID-19 restrictions these hands-on lab exercises will be replaced by simulations). You will have to complete the pre-lab exercises to commence the laboratory practicals. Further details will be available in the unit moodle site.

Assessment Due Date

Week 11 Wednesday (30 Sept 2020) 11:55 pm AEST

Return Date to Students

Review/Exam Week Wednesday (14 Oct 2020)

Marked lab reports with feedback.

Weighting

20%

Minimum mark or grade

50%

Assessment Criteria

Marks will be allocated to :

1. Active contribution in group work (if applicable)
2. Following the correct procedures during the experimentation.
3. Correct results.
4. Analysis of results and discussion.
5. Conclusions.

Referencing Style

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

Submission

Online

Learning Outcomes Assessed

- Apply common industrial data bus protocols and use them in data acquisition and control programs
- Specify requirements for sensors, actuators, and accessories for a given process automation module, and select suitable components from a range of available options
- Program industrial PLCs to provide real-time solutions for industrial automation problems
- Implement complete solutions for industrial process automation problems
- Solve real life problems and communicate professionally using instrumentation engineering terminology, symbols and diagrams that conform to Australian and international standards
- Work individually and collaboratively in teams, communicate professionally in presenting your solutions.

Graduate Attributes

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

4 Take Home Examination

Assessment Type

Take Home Exam

Task Description

No Assessment Task Description

Assessment Due Date

Take Home Examination will be held during the University examination period

Return Date to Students**Weighting**

40%

Minimum mark or grade

50%

Assessment Criteria

Marks will be allocated for the following things:

1. Application of theoretical fundamentals.
2. Correct diagrams using standard notations.
3. Explanation of reasons to apply specific theory to solve a given problem where applicable.
4. Correct mathematical working and correct answer.
5. All working must be shown to obtain full marks
6. Neatness and format.

More specific details will be in the examination paper itself.

Referencing Style

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

Submission

Online

Learning Outcomes Assessed

- Describe the need for instrumentation amplifiers in an instrumentation system and their operation

Graduate Attributes

- Communication
- Problem Solving
- Critical Thinking
- Information Technology Competence
- Ethical practice

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