ENEX13001 *Instrumentation and Industrial Automation*

Term 2 - 2018

Profile information current as at 15/05/2024 06:16 am

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. Students enrolled in distance mode are required to attend a compulsory Residential School.

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 Elecctronics & 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 - 2018

- Mackay
- 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: 20%
2. **Written Assessment**
Weighting: 20%
3. **Practical Assessment**
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 'Have your say' survey

Feedback
The lab sessions were interesting and relevant.

Recommendation
The lab sessions will be further improved with more interesting experiments.

Feedback from 'Have your say' survey

Feedback
The assignments were good as they were directly related to the core concepts of the unit.

Recommendation
This good practice of aligning the assignments to the core learning will be there in the future as well.

Feedback from 'Have your say' survey

Feedback
More emphasis on industrial instrumentation techniques would be better.

Recommendation
Since this is the first instrumentation unit, more emphasis is on understanding essential fundamentals first and then learn about their industrial implementation.

Feedback from 'Have your say' survey

Feedback
Assessment criteria terms are not clear enough.

Recommendation
More emphasis will be placed on students being made aware of the assessment criteria.

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

— 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	6	7
1 - Written Assessment - 20%	•				•		•
2 - Written Assessment - 20%		•	•	•	•	•	•
3 - Practical Assessment - 20%		•	•	•	•	•	•
4 - Examination - 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 - Examination - 40%	•	•	•			•		•		

Textbooks and Resources

Textbooks

ENEX13001

Prescribed

Principles of Measurement Systems
4th Edition (2005)
Authors: John P Bentley
Pearson Education Ltd.
Harlaw , Essex , England
ISBN: 0-130-43028-5
Binding: Hardcover

Additional Textbook Information

View textbooks at the CQUniversity Bookshop

IT Resources

You will need access to the following IT resources:

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

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 - 09 Jul 2018

Module/Topic	Chapter	Events and Submissions/Topic
• Introduction to measurement systems, static characteristics, and accuracy of measurements	• CH1 • CH2 • CH3	

Week 2 - 16 Jul 2018

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

Week 3 - 23 Jul 2018

Module/Topic	Chapter	Events and Submissions/Topic
• Introduction to Industrial Automation	• Lecture notes/ Slides	

Week 4 - 30 Jul 2018

Module/Topic	Chapter	Events and Submissions/Topic
• Signal Conditioning Elements	• CH9 • Lecture notes/ Slides	

Week 5 - 06 Aug 2018

Module/Topic	Chapter	Events and Submissions/Topic
• Loading Effects and Twoport Networks • PLC Programming Fundamentals I	• CH5 • Lecture notes/ Slides	**Assignment 1** Due: Week 5 Wednesday (8 Aug 2018) 11:55 pm AEST

Vacation Week - 13 Aug 2018

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 20 Aug 2018

Module/Topic	Chapter	Events and Submissions/Topic
• Signals and Noise in Measurement Systems • PLC Programming Fundamentals II	• CH6 • Lecture notes/ Slides	

Week 7 - 27 Aug 2018

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

Week 8 - 03 Sep 2018

Module/Topic	Chapter	Events and Submissions/Topic
• Industrial Process Control Systems	• Lecture notes/ Slides	

Week 9 - 10 Sep 2018

Module/Topic	Chapter	Events and Submissions/Topic
• Data Acquisition and Communications Systems • Industrial Data Communications Protocols	• CH18 • Lecture notes/ Slides	

Week 10 - 17 Sep 2018

Module/Topic	Chapter	Events and Submissions/Topic
• Industrial Instrumentation Busses and Their Applications	• Lecture notes/ Slides	**Assignment 2** Due: Week 10 Friday (21 Sept 2018) 11:55 pm AEST

Week 11 - 24 Sep 2018

Module/Topic	Chapter	Events and Submissions/Topic
• Sensing Elements • Flow MEasurement Systems • Ultrasonic Measurement Systems	• CH8 • CH12 • Ch16	**Laboratory Exercises - Practical and Written Assessment** Due: Week 11 Friday (28 Sept 2018) 11:55 pm AEST

Week 12 - 01 Oct 2018

Module/Topic	Chapter	Events and Submissions/Topic
• Parasitic Elements in Measurement Sysems • Optical Measurement Systems	• CH 14 • CH15	

Review/Exam Week - 08 Oct 2018

Module/Topic	Chapter	Events and Submissions/Topic

Exam Week - 15 Oct 2018

Module/Topic	Chapter	Events and Submissions/Topic

Term Specific Information

Assessment Tasks

1 Assignment 1

Assessment Type
Written Assessment

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

Assessment Due Date
Week 5 Wednesday (8 Aug 2018) 11:55 pm AEST

Return Date to Students
Week 7 Thursday (30 Aug 2018)
Marked assignment and a model answer will be provided.

Weighting
20%

Assessment Criteria
Marks will be allocated for the following things:

1. Application of theoretical fundamentals.
2. Correct diagrams.
3. Explanation of reasons to apply specific theory to solve a given problem where applicable.
4. correct mathematical working and correct answer.
5. Neatness and format.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Submit the answers as a single pdf file. You are free to scan and embedd clearly hand written answers into the pdf.

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 (21 Sept 2018) 11:55 pm AEST

Return Date to Students
Week 12 Friday (5 Oct 2018)
Marked assignment and model a answer will be provided.

Weighting
20%

Assessment Criteria
Marks will be allocated for the following things:

1. Application of theoretical fundamentals.
2. Correct diagrams.
3. Explanation of reasons to apply specific theory to solve a given problem where applicable.
4. correct mathematical working and correct answer.
5. Neatness and format.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Submit the answers as a single pdf file. You are free to scan and embedd clearly hand written answers into the pdf.

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. 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 Friday (28 Sept 2018) 11:55 pm AEST

Return Date to Students
Review/Exam Week Friday (12 Oct 2018)
Marked lab reports with feedback. However, there will be no model answer provided.

Weighting
20%

Minimum mark or grade
50% of the allocated marks.

Assessment Criteria
Marks will be allocated to :

1. Following the correct procedures during the experimentation.
2. Correct results.
3. Analysis of results and discussion.
4. Conclusions.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Submit the answers as a single pdf file. You are free to scan and embedd clearly hand written answers into the pdf.

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

Examination

Outline
Complete an invigilated examination.

Date
During the examination period at a CQUniversity examination centre.

Weighting
40%

Length
180 minutes

Minimum mark or grade
50% of the allocated marks.

Exam Conditions
Open Book.

Materials
Dictionary - non-electronic, concise, direct translation only (dictionary must not contain any notes or comments).
Calculator - all non-communicable calculators, including scientific, programmable and graphics calculators are authorised

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