# BIOL12109 *Technology and Instrumentation*
## Term 2 - 2019

Profile information current as at 10/05/2024 09:39 pm

All details in this unit profile for BIOL12109 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

In this unit you will examine new technologies and innovative practices used in sustainable agricultural and industrial production, food processing and environmental analysis. By examining a range of measurement technologies, you will identify how they can be used to facilitate production efficiency, to undertake product and process monitoring, and for research and analysis. You will also study the principles of instrumentation design and research emerging technology trends by accessing current scientific literature. At a compulsory residential school, you will develop analytical and laboratory skills using a range of instrumentation.

### Details

Career Level: *Undergraduate*
Unit Level: *Level 2*
Credit Points: *6*
Student Contribution Band: *7*
Fraction of Full-Time Student Load: *0.125*

### Pre-requisites or Co-requisites

CHEM11041 - Chemistry for the Life Sciences
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 - 2019

- 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).

### 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: 25%
2. **Presentation**
Weighting: 15%
3. **Practical Assessment**
Weighting: 20%
4. **Online Quiz(zes)**
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 moodle and in class

**Feedback**

oral presentations could be completed online instead of at res; with students ask questions/provide feedback on say 3 or 4 of the presentations

**Recommendation**

adopt on-line presentations, with the best 4 invited to present at Residential

### Feedback from moodle

**Feedback**

lectures have great content, but sometimes a bit too much in one lot. suggest split up into smaller chunks and allow more content. e.g., 3 x 0.75hr videos are easier to watch than 1 x 1.5 hour video.

**Recommendation**

Break presentations into smaller units

### Feedback from moodle

**Feedback**

one assignment could be a choice of what product would be more suitable for a certain situation, with a choice of 1 of 5 different situations

**Recommendation**

change context of one assignment

### Feedback from moodle

**Feedback**

a supportive environment was provided in the class. Weekly quizzes forced continual study, gave immediate feedback where improvement was needed, and alleviated exam load (improving study for other subjects). Practicum of res school was appreciated, with tasks seen to be " informative and related to what we will need to know in our professional lives", including technical asks like soldering. The input of research postdocs and postgrads was also appreciated. The weekly quizzes kept students engaged.

**Recommendation**

positive feedback received, with effort behind the areas of positive comment to be maintained

# Unit Learning Outcomes

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

1. Describe technologies and instrumentation used in agricultural and industrial production, food processing and environmental analysis
2. Perform analyses and calculations using selected technologies and instrumentation
3. Interpret data obtained from a variety of instrumentation used in agricultural and industrial production, food processing and environmental analysis
4. Research potential applications of emerging technologies in agricultural and industrial production, food processing and environmental analysis.

# 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 |
| 1 - Written Assessment - 25% | ● | | | ● |
| 2 - Presentation - 15% | ● | | | ● |
| 3 - Practical Assessment - 20% | | ● | ● | |
| 4 - Online Quiz(zes) - 40% | ● | ● | ● | |

## Alignment of Graduate Attributes to Learning Outcomes

| Graduate Attributes | Learning Outcomes | | | |
| --- | :---: | :---: | :---: | :---: |
| | 1 | 2 | 3 | 4 |
| 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 - 25% | ● | | ● | ● | | ● | | | | |
| 2 - Presentation - 15% | ● | ● | ● | | | ● | | | | |
| 3 - Practical Assessment - 20% | ● | ● | ● | | ● | ● | | | | |
| 4 - Online Quiz(zes) - 40% | | ● | ● | ● | | | | | | |

## Textbooks and Resources

### Textbooks

**There are no required textbooks.**

### 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

**Kerry Walsh** Unit Coordinator
[k.walsh@cqu.edu.au](mailto:k.walsh@cqu.edu.au)

## Schedule

### Week 1 Enterpreneurship, IP and Commercialisation - 15 Jul 2019

| Module/Topic | Chapter | Events and Submissions/Topic |
|---|---|---|
| Introduction to unit Enterpreneurship, IP and commercialisation | readings in Moodle | quiz |

### Week 2 Sampling Theory - 22 Jul 2019

| Module/Topic | Chapter | Events and Submissions/Topic |
|---|---|---|
| Sample preparation and sampling theory - probability and statistics | readings in Moodle | quiz |

### Week 3 Error of Measurement - 29 Jul 2019

| Module/Topic | Chapter | Events and Submissions/Topic |
|---|---|---|
| Error of measurement and measurement of error | readings in Moodle | quiz |

### Week 4 Instrumentation Basics - 05 Aug 2019

| Module/Topic | Chapter | Events and Submissions/Topic |
|---|---|---|
| Instrumentation basics | readings in Moodle | quiz |

### Week 5 Microscopies - 12 Aug 2019

| Module/Topic | Chapter | Events and Submissions/Topic |
|---|---|---|
| Techniques I - microscopies (light, phase, dark, polarising, SEM, TEM, confocal, AFM, etc) | readings in Moodle | quiz |

### Vacation Week - 19 Aug 2019

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

## Week 6 Transducers and analytical instrumentation - 26 Aug 2019

| Module/Topic | Chapter | Events and Submissions/Topic |
| --- | --- | --- |
| Techniques II – displacement, temperature, pressure, flow, liquid level, speed, vibration, acceleration, force, torque, power, strain, stress, viscosity, surface tension, humidity, density – sensors (transducers) and analytical instrumentation | readings in Moodle | quiz |

## Week 7 Chemometrics - 02 Sep 2019

| Module/Topic | Chapter | Events and Submissions/Topic |
| --- | --- | --- |
| Techniques III – Introduction to basic chemometrics (regression techniques) | readings in Moodle | quiz<br><br>**Sensor Technology : case study I** Due: Week 7 Monday (2 Sept 2019) 12:59 pm AEST |

## Week 8 Adding Spatial Data - 09 Sep 2019

| Module/Topic | Chapter | Events and Submissions/Topic |
| --- | --- | --- |
| Techniques IV - Adding spatial data – geo-positioning techniques and mapping | readings in Moodle | quiz |

## Week 9 Remote sensing - 16 Sep 2019

| Module/Topic | Chapter | Events and Submissions/Topic |
| --- | --- | --- |
| Remote sensing - near and far | readings in Moodle | quiz<br>compulsory residential school held in Rockhampton  21 to 23 September<br><br>**Sensor Technology : case study II. Oral presentation with supporting material.** Due: Week 9 Friday (20 Sept 2019) 11:45 pm AEST |

## Week 10 Data acquisition and control - 23 Sep 2019

| Module/Topic | Chapter | Events and Submissions/Topic |
| --- | --- | --- |
| Interfacing for data acquisition and control; process control; communications | readings in Moodle | quiz |

## Week 11 Decision Support Systems - 30 Sep 2019

| Module/Topic | Chapter | Events and Submissions/Topic |
| --- | --- | --- |
| Using information – control systems, decision support systems; modelling - starting with regression | readings in Moodle | quiz |

## Week 12 review - 07 Oct 2019

| Module/Topic | Chapter | Events and Submissions/Topic |
| --- | --- | --- |
| Examples - technology uptake Review | | quiz<br><br>**Practical Assessment** Due: Week 12 Monday (7 Oct 2019) 11:45 pm AEST |

## Review/Exam Week - 14 Oct 2019

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

## Exam Week - 21 Oct 2019

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

## 1 Sensor Technology : case study I

**Assessment Type**
Written Assessment

**Task Description**
The assessment task involves review of a sensor technology product in terms of
(i) principle of operation;
(ii) operational limits - detection limit, error of measurement, interferences etc;
(iii) comparison of available products;
(iv) consideration of likely future developments.
(v) consideration of patents on the technology and the commercial standing of the manufacturer
The assignment may be written as a justification for acquisition of a particular technology.
As a guideline, the essay main body should be approximately 3000 words, excluding references - essays that are substantially longer (e.g. 3500 words) or shorter (e.g. 2500 words) are unlikely to score as highly as those that make the best use of the 3000 word length.
A typical response might involve access of a general technical text or website for general information on the principle of operation, primary scientific journal articles and/or patents on the development and application of the technology of interest, and websites (application notes etc) of commercial entities involved in the production and distribution of the technology. **Do attempt a patent search around the technology, and a search on the status of the manufacturing company (history, current status).** The product reviewed should be drawn from the topics to be covered in this unit. Example topics include: a handheld Xray spectrometer for quantifying metal composition, a NIR spectrometer for compositional analysis of grain, an electronic nose for cadaver detection, a stream-flow guaging device.We will discuss the task in the first two weeks of term, with illustration of parallel exercises.
Text should be word-processed with appropriate layout and use of headings/sub-headings. Diagrams should be used to illustrate specific aspects. Do cite/reference all diagrams used. Avoid large file size images - save any images in lower resolution, to decrease the file size. The list of references should form the last page or two, at the end of the assessment. Referencing should be in a consistent style - typically Harvard or APA formats (choose a style and be consistent within that style). Please save/upload your file in either a Word format (.doc or .docx) or in a basic text format that can be opened in Word.

**Assessment Due Date**
Week 7 Monday (2 Sept 2019) 12:59 pm AEST

**Return Date to Students**
Week 8 Friday (13 Sept 2019)
is Friday 13 lucky or unlucky? - do take feedback on board for second assessment task

**Weighting**
25%

**Minimum mark or grade**
A minimum mark of 45% is required

**Assessment Criteria**
This assignment aims to assess:
(a) written communication skills; including referencing;
(b) ability to source and synthesise relevant information, including patent and commercial information, and
(c) an understanding of the principle of operation around the use of a particular technology in a food/agricultural/environmental/medical application.
These areas will contribute 10, 10, and 80% of the awarded grade. The third criterion will be considered in terms of four topics (weighted 50:10:10:10) as follows
(i) principle of operation;
(ii) operational limits - detection limit, error of measurement, interferences etc;
(iii) comparison of available products;
(iv) consideration of likely future developments.

**Referencing Style**

- Harvard (author-date)

**Submission**
Online

**Learning Outcomes Assessed**

- Describe technologies and instrumentation used in agricultural and industrial production, food processing and environmental analysis
- Research potential applications of emerging technologies in agricultural and industrial production, food processing and environmental analysis.

**Graduate Attributes**

- Communication
- Critical Thinking
- Information Literacy
- Information Technology Competence

# 2 Sensor Technology : case study II. Oral presentation with supporting material.

**Assessment Type**
Presentation

**Task Description**
This assignment replicates that of the first assignment, with presentation on a different technology/application, and presentation via oral and Powerpoint, rather than an essay/Word format. Possible topics include: (i) You have to install sensors across a field site of approx 1 x 10 km round a Rockhampton abbatoir. Report on suitabillity of use of SigFox for remote logging communications. (ii) You are tasked to assess organic acids in a process stream, once per minute. Recommend a technology. (iii) Use of Deep Learning to recognise features in satellite images.
You are requested to submit a recording and associated Powerpoint, of 15 minutes duration. These will be posted on Moodle, with opportunity for class discussion, and in Residential School you will present and single summary slide and take 5-10 minutes of questions. You might approach this as a presentation to your employer about a particular technology, presenting the case for investment/purchase.
The aims are similar to the first assignment:
(a) communication skills; including oral and use of supporting aids;
(b) ability to source and synthesise relevant information and
(c) demonstrate understanding of the principle of operation around the use of a particular technology in a food/agricultural/environmental/medical application.
The third criterion will be considered in terms of :
(i) principle of operation;
(ii) operational limits - detection limit, error of measurement, interferences etc;
(iii) comparison of available products;
(iv) consideration of likely future developments.
The oral presentation will be delivered in residential school. Pre-submission of supporting aids (Powerpoint slides) is recommended for informal feedback before the Residential school.
Refer to the description of the first assignment task for further detail.

**Assessment Due Date**
Week 9 Friday (20 Sept 2019) 11:45 pm AEST
An oral presentation follow up will occur during Residential School.

**Return Date to Students**
Week 12 Friday (11 Oct 2019)
Feedback on the oral component will be given during Residential School.

**Weighting**
15%

**Minimum mark or grade**
45%

**Assessment Criteria**
The oral presentation will be assessed on clarity of presentation and visual aids, on the level of understanding of the measurement principle and of the application context, as demonstrated in presentation and in addressing questions. A presentation time of approx 15 min with 5-10 min of questions is anticipated.
This written component will be assessed on:
(a) communication skills; including referencing;
(b) ability to source and synthesise relevant information, including technical, patent and commercial information, and
(c) demonstrate understanding of the principle of operation around the use of a particular technology in a food/agricultural/environmental/medical application.
These areas will contribute 25, 25, and 50% of the awarded grade, respectively.
The third criterion will be considered in terms of four topics (weighted 30:10:10:10, respectively):

(i) principle of operation;
(ii) operational limits - detection limit, error of measurement, interferences etc;
(iii) comparison of available products;
(iv) consideration of likely future developments.

**Referencing Style**

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

**Submission**
Offline Online

**Submission Instructions**
The oral presentation will be made during residential school. Submission of supporting material (e.g. ppt) should be made through Moodle.

**Learning Outcomes Assessed**

- Describe technologies and instrumentation used in agricultural and industrial production, food processing and environmental analysis
- Research potential applications of emerging technologies in agricultural and industrial production, food processing and environmental analysis.

**Graduate Attributes**

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

# 3 Practical Assessment

**Assessment Type**
Practical Assessment

**Task Description**
Practical Report: a scientific report on activity undertaken at the Residential School is required, following the standard format of: Title/author/Abstract/Introduction/Materials and Methods/Results/ Discussion/References. Data will be provided from that collected at Residential School. Details will be provided at the Residential School.

**Assessment Due Date**
Week 12 Monday (7 Oct 2019) 11:45 pm AEST
Given Residential School is in early week 10, I have pushed the formal submission date back as far as possible - but you should it out of your hair and submitted earlier!

**Return Date to Students**
Review/Exam Week Monday (14 Oct 2019)
I will try to return as soon as possible

**Weighting**
20%

**Minimum mark or grade**
45%

**Assessment Criteria**
This submission will be assessed on :
(a) correct use of scientific reporting format (Title, Abstract, Introduction, Materials and Methods. Results, Discussion, References);
(b) adequate literature review;
(c) experimental design and description;
(d) data presentation and analysis;
(e) interpretation.
Marks will be awarded to these five areas, weighted 10, 25, 15, 25, and 25% of total grade, respectively.

**Referencing Style**

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

**Submission**
Online

**Learning Outcomes Assessed**

- Perform analyses and calculations using selected technologies and instrumentation
- Interpret data obtained from a variety of instrumentation used in agricultural and industrial production, food processing and environmental analysis

**Graduate Attributes**

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

# 4 Online Quizzes

**Assessment Type**
Online Quiz(zes)

**Task Description**
The Moodle site contains on-line quizzes associated with each major topic covered in the course. These quizzes are intended to form a progressive assessment of your understanding of the terminology and principles covered in this unit, to ensure a developing knowledge of the unit topic content throughout the term.
Each quiz will open at the beginning of the relevant week and will close two weeks later (except weeks 11 and 12, which need to close earlier). Each quiz (except the final review quizz) draws a random selection of 10 questions from a question bank. Questions will generally be multiple choice, but other questions types may be used (e.g. calculation, short answer). Two attempts are permitted, with best mark accepted.

**Number of Quizzes**
12

**Frequency of Quizzes**
Weekly

**Assessment Due Date**

to be undertaken within two weeks of the scheduled start day of the topic (check Moodle site for weekly topics)

**Return Date to Students**

Instant marking and return (on line)

**Weighting**
40%

**Minimum mark or grade**
50

**Assessment Criteria**
A minimum average grade on the quizzes of 50% is required to pass the unit.

**Referencing Style**

- Harvard (author-date)

**Submission**
Online

**Submission Instructions**
Undertake the (weekly) quizz associated with each major topic area on the Moodle site within the alloted time.

**Learning Outcomes Assessed**

- Describe technologies and instrumentation used in agricultural and industrial production, food processing and environmental analysis
- Perform analyses and calculations using selected technologies and instrumentation
- Interpret data obtained from a variety of instrumentation used in agricultural and industrial production, food processing and environmental analysis

**Graduate Attributes**

- Problem Solving
- Critical Thinking

- Information Literacy

## 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