



# CHEM13081 *Biomaterials: Environmental and Medical Applications*

## Term 2 - 2019

Profile information current as at 01/05/2024 06:22 pm

All details in this unit profile for CHEM13081 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 is an introduction to the use and usefulness of biomaterials. It introduces the materials science of metals, ceramics, polymers and composites, and the engineering principles behind biomaterial design. The medical and environmental applications of biomaterials, such as biomedical engineering, bioactive polymers and antifouling biofilms, will be discussed.

### 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

Pre-requisite: CHEM11041 Chemistry for the Life Sciences or CHEM11042 Fundamentals of Chemistry

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. **Practical Assessment**

Weighting: 15%

#### 2. **Written Assessment**

Weighting: 25%

#### 3. **Written Assessment**

Weighting: 10%

#### 4. **Examination**

Weighting: 50%

### 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, student emails

**Feedback**

Students found the Moodle layout, particularly the incorporation of buttons, useful for navigation

**Recommendation**

The layout of the Moodle site will be maintained

#### Feedback from Have your say survey, student emails

**Feedback**

Students provided a range feedback for the assessments. While feedback showed that students found the assessment (particularly the group work elements) challenging, a number indicated that they felt it was a great experience. Others felt it was too difficult and expressed their belief that group work on a whole is not an accurate assessment of individual contributions.

**Recommendation**

The assessments for this unit, involved group work and self-directed study/research. Both of these skills are essential to produce career ready graduates, and as such are graduate attributes CQUniversity promotes. The unit coordinator would note that in an effort to ensure that students efforts are properly reflected in their grade for the group work assessment - a percentage of the marks awarded was determined by the students themselves via peer assessment/review. A greater effort will be made to emphasise this information to students in future offerings.

#### Feedback from Have your say survey

**Feedback**

Students appreciated the timely return of assessment marks and feedback

**Recommendation**

The Chemistry team will continue their efforts to return feedback and marks in an appropriate time frame

#### Feedback from Have your say survey

**Feedback**

Students felt that the residential school was of great benefit and highlighted the efforts of the support staff throughout.

**Recommendation**

The Chemistry team will continue to their efforts to ensure a good learning experience for the students.

## Unit Learning Outcomes

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

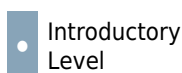
1. Describe the various types of biomaterials and the principles of biomaterial design and development.
2. Discuss strategies to solve significant problems in health and the environment using the principles of biomaterial science.
3. Discuss the responses of living tissues to implanted biomaterials.
4. Evaluate the use and usefulness of biomaterials and devices constructed with biomaterials.
5. Assess the compatibility of biomaterials in health and environmental disciplines and apply the appropriate compatibility requirements to real world applications.

Potential RACI accreditation of the unit - currently in discussion with the RACI.

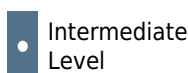
## Alignment of Learning Outcomes, Assessment and Graduate Attributes



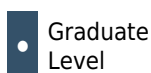
N/A  
Level



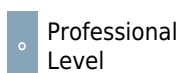
Introductory  
Level



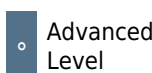
Intermediate  
Level



Graduate  
Level



Professional  
Level



Advanced  
Level

## Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes				
	1	2	3	4	5
1 - Practical Assessment - 15%		•		•	•
2 - Written Assessment - 25%		•			
3 - Written Assessment - 10%	•				
4 - Examination - 50%			•		•

## 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					

## Alignment of Assessment Tasks to Graduate Attributes

Assessment Tasks	Graduate Attributes									
	1	2	3	4	5	6	7	8	9	10
1 - Practical Assessment - 15%		•	•		•					
2 - Written Assessment - 25%	•	•					•	•		
3 - Written Assessment - 10%	•		•	•						
4 - Examination - 50%	•	•	•							

## Textbooks and Resources

### Textbooks

CHEM13081

#### Prescribed

##### **An Introduction to Biomaterials**

Edition: 2 (2012)

Authors: Jeffrey O. Hollinger

CRC Press

Boca Raton , Florida , US

ISBN: 978-1-4398-1256-3

Binding: eBook

#### Additional Textbook Information

Please be aware that the ebook is available to students via the CQUniversity library and does not need to be purchased. However, multiple user access is limited, so if you would prefer your own copy, you can purchase one at the CQUni Bookshop here: <http://bookshop.cqu.edu.au> (search on the Unit code)

### 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: [Vancouver](#)  
For further information, see the Assessment Tasks.

## Teaching Contacts

**Aoife Power** Unit Coordinator

[a.power@cqu.edu.au](mailto:a.power@cqu.edu.au)

**Shaneel Chandra** Unit Coordinator

[s.chandra@cqu.edu.au](mailto:s.chandra@cqu.edu.au)

## Schedule

### Week 1 - 15 Jul 2019

Module/Topic	Chapter	Events and Submissions/Topic
Introduction to Biomaterials - History - Potential		

### Week 2 - 22 Jul 2019

Module/Topic	Chapter	Events and Submissions/Topic
Biomaterials Surfaces: Physics - Surface properties and cell adhesion		Students should be preparing for Assessment 1 - Planning investigative experiment

### Week 3 - 29 Jul 2019

Module/Topic	Chapter	Events and Submissions/Topic
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Biomaterials Surfaces: Chemistry  
 - Chemisorption on metals and oxides  
 - Aqueous corrosion of metals  
 - Polymer

**Week 4 - 05 Aug 2019**

Module/Topic	Chapter	Events and Submissions/Topic
Biomaterials Surfaces: Bio-chemistry - Protein interaction - Cell-surface interaction		Ensure your complete list of consumables (chemicals), glassware (with size and number required) and instrumentation required for the investigative experiment associated with assessment 1 is provided to academic and technical staff by 3 pm AEST, Friday August 9th 2019.

**Week 5 - 12 Aug 2019**

Module/Topic	Chapter	Events and Submissions/Topic
Surface modification of Biomaterials		

**Vacation Week - 19 Aug 2019**

Module/Topic	Chapter	Events and Submissions/Topic

**Week 6 - 26 Aug 2019**

Module/Topic	Chapter	Events and Submissions/Topic
Biomaterials and Nanomaterials		

**Week 7 - 02 Sep 2019**

Module/Topic	Chapter	Events and Submissions/Topic
Residential School		Residential School - Rockhampton 3rd - 5th September 2019 inclusive

**Week 8 - 09 Sep 2019**

Module/Topic	Chapter	Events and Submissions/Topic
Biosensors		

**Week 9 - 16 Sep 2019**

Module/Topic	Chapter	Events and Submissions/Topic
Biomaterials for medical applications - Drug Delivery		<b>Assessment 2 (Written) - linked with Assessment 1</b> Due: Week 9 Friday (20 Sept 2019) 11:55 pm AEST

**Week 10 - 23 Sep 2019**

Module/Topic	Chapter	Events and Submissions/Topic
Biomaterials for medical applications - Tissue generation		<b>Assessment 3 (Written)</b> Due: Week 10 Friday (27 Sept 2019) 11:55 pm AEST

**Week 11 - 30 Sep 2019**

Module/Topic	Chapter	Events and Submissions/Topic
Biomaterials for medical applications - Medical devices		

**Week 12 - 07 Oct 2019**

Module/Topic	Chapter	Events and Submissions/Topic
Biomaterials for environmental applications		

**Review/Exam Week - 14 Oct 2019**

Module/Topic	Chapter	Events and Submissions/Topic

## Assessment Tasks

### 1 Assessment 1 (Practical and Written) - linked with assessment 2

#### Assessment Type

Practical Assessment

#### Task Description

Advanced scientific projects and research are invariably subject to much scrutiny. Other scientists in the field will be looking at your work and will expect that the data has been rigorously analysed. Rigorous analysis requires careful experimental design.

Prior to undertaking research, you need to consider and anticipate the types of observations you'll be making, the likely outcomes, and how you can evaluate your data to differentiate statistically between outcomes. Failure to do so will most likely result in the experiment(s) not providing informative data, which is poor science and a waste of resources.

In this assessment, you will work in groups (self-allocated or assigned at the beginning of the term, in week 2) to develop an experiment linked with a biomaterial related challenge (listed on the Moodle site) and design an experiment(s) to address that challenge. You will prepare an investigative/experimental proposal and conduct the experiment(s) during the residential school.

The first step to this inquiry-based practical is the identification of a biomaterial related challenge that can be evaluated through measurement. The challenge topics should have the following attributes:

- Relevant to the Australian context
- It should be able to be completed within the three day residential school.

The equipment and resources proposed for the exercise must be available in the laboratory. To ensure this, please liaise with the academic and technical staff associated with CHEM13080, via Moodle as you develop your proposal. Ensure your complete list of consumables (chemicals), glassware (with size and number required) and instrumentation required is provided to academic and technical at the latest by **3 pm AEST, Friday August 9th 2019**.

Your experimental proposal must also be submitted prior to residential school. The proposal should contain the typical elements of scientific writing including:

- brief background to the issue,
- presentation the of research idea,
- scientific methodology and approach to investigating the problem,
- anticipated outcomes/findings and
- potential impacts
- Students' individual practical skill set (assessed during the residential school).

#### Assessment Due Date

1. Equipment and consumables list must be submitted via Moodle by 3 PM August 9th 2019. 2. Proposal to be submitted via Moodle by 11:55 PM AEST 16th August 2019 3. The experiment will be conducted as part of the residential school between September 3rd - 5th 2019

#### Return Date to Students

Feedback will be delivered via Moodle

#### Weighting

15%

#### Minimum mark or grade

40%

#### Assessment Criteria

General Guidelines

- The proposal should be coherent, have flow and there should be no typographical errors.
- Text should be word-processed, with appropriate layout and use of headings/sub-headings.
- Tables and figures to illustrate specific aspects may be included with titles and acknowledgement where

necessary.

- Figures and tables should be correctly labelled.
- All material sourced externally must be cited in the correct format.
- The references should be listed at the end of the assessment.
- Please avoid images with very large file sizes as this will make your manuscript too large to upload/download.

The assessment task must be completed and submitted by the due date and time. In the absence of an approved extension, there will be no opportunity to complete the task after this date and there will be no supplementary exam or assessment offered should you come close to passing the unit but do not meet the criteria for a Pass grade for the overall unit.

Marking Criteria

Detailed marking criteria will be available on the unit Moodle site, and will be based on the following:

- Clarity of objectives and focus of the work (25%)
- Validity of experimental design (50%)
- Use of literature (25%)

### Referencing Style

- [Vancouver](#)

### Submission

Online

#### Submission Instructions

1. Equipment and consumables list must be submitted via Moodle by 3 PM August 9th 2019. 2. Proposal to be submitted via Moodle by 11:55 PM AEST 16th August 2019 3. The experiment will be conducted as part of the residential school between September 3rd - 5th 2019

#### Learning Outcomes Assessed

- Discuss strategies to solve significant problems in health and the environment using the principles of biomaterial science.
- Evaluate the use and usefulness of biomaterials and devices constructed with biomaterials.
- Assess the compatibility of biomaterials in health and environmental disciplines and apply the appropriate compatibility requirements to real world applications.

#### Graduate Attributes

- Problem Solving
- Critical Thinking
- Team Work

## 2 Assessment 2 (Written) - linked with Assessment 1

### Assessment Type

Written Assessment

### Task Description

Students will report the findings from their investigative exercise (assessment 1) in the form of a scientific manuscript. The manuscript should be in the format of either the journal [Biomaterials Science](#) or the [Journal of Chemical education](#). The formatting and author guidelines can be found on the individual journal's websites. Adherence to these guidelines is a part of the Assessment Criteria for this exercise.

Please Note: This is a group submission.

### Assessment Due Date

Week 9 Friday (20 Sept 2019) 11:55 pm AEST

### Return Date to Students

Week 12 Monday (7 Oct 2019)

Feedback will be delivered via Moodle

### Weighting

25%

### Minimum mark or grade

40 %



## Assessment Criteria

A full assessment rubrics will be available on the unit Moodle site, using the following criteria:

- The manuscript should be coherent, have flow and all material sourced externally must be cited in the correct format.
- Text should be word-processed, with appropriate layout and use of headings/sub-headings. Tables and figures to illustrate specific aspects may be included with titles and acknowledgement where necessary.
- Please avoid images with very large file sizes as this will make your essay too large to upload/download.
- Data should be clearly presented, e.g. numerical data must be tabulated.
- Figures and tables should be correctly labelled.
- There should be no typographical errors

General marking criteria

- Abstract (5 %)
- Literature review (25 %)
- Results presentation and analysis (20 %)
- Discussion (30 %)
- Conclusion (10 %)
- Presentation adherence to [Biomaterials Science](#) or [Journal of Chemical Education](#) guidelines (10 %)

## Referencing Style

- [Vancouver](#)

## Submission

Online

### Submission Instructions

Online submission in Moodle (docx and doc only submissions)

## Learning Outcomes Assessed

- Discuss strategies to solve significant problems in health and the environment using the principles of biomaterial science.

## Graduate Attributes

- Communication
- Problem Solving
- Cross Cultural Competence
- Ethical practice

## 3 Assessment 3 (Written)

### Assessment Type

Written Assessment

### Task Description

#### **Critical analysis of a real world biomaterial, currently being applied in medicine, the environment or agriculture**

Report writing is a key benchmark of the scientific endeavour applying the principles of knowledge value, the accuracy of interpretation and succinct, timely communication of findings. In this assessment, you will be tasked with reporting your critique on a real world biomaterial currently used in either the medical, environmental or agricultural field.

The biomaterial will be provided to you by the unit coordinator during the residential school.

You will need to scrutinise the product supplied:

- How is the product packaged?
- Was there any labelling?
- Is there an expiry date - why?
- Will sterilisation of the material or packaging affect the make-up of the material?
- How does the biomaterial or device function?
- Are there any FDA classifications?
- Give comment on whether newer products have been released and why?

Products may include:

- Oral Health dental materials
- Veterinary sutures

- CIDR device for cattle
- Biomaterials used in paramedicine

**Assessment Due Date**

Week 10 Friday (27 Sept 2019) 11:55 pm AEST

**Return Date to Students**

Week 12 Wednesday (9 Oct 2019)

Feedback will be delivered via Moodle

**Weighting**

10%

**Minimum mark or grade**

40%

**Assessment Criteria**

General Guidelines

- Text should be word-processed, with appropriate layout and use of headings/sub-headings. Tables and figures to illustrate specific aspects may be included with titles and acknowledgement where necessary.
- Please avoid images with very large file sizes as this will make your report too large to upload/download.
- Any references should be listed at the end of the assessment.
- The assessment task must be completed and submitted by the due date and time. In the absence of an approved extension, there will be no opportunity to complete the task after this date and there will be no supplementary exam or assessment offered should you come close to passing the unit but do not meet the criteria for a Pass grade for the overall unit.

Marking Criteria

- The report should be coherent, have flow and all material sourced externally must be cited in the correct format.
- Data should be clearly presented, e.g. numerical data must be tabulated.
- Figures and tables should be correctly labelled.
- There should be no typographical errors.

**Referencing Style**

- [Vancouver](#)

**Submission**

Online

**Learning Outcomes Assessed**

- Describe the various types of biomaterials and the principles of biomaterial design and development.

**Graduate Attributes**

- Communication
- Critical Thinking
- Information Literacy

## Examination

**Outline**

Complete an invigilated examination.

**Date**

During the examination period at a CQUniversity examination centre.

**Weighting**

50%

**Length**

180 minutes

**Minimum mark or grade**

40

**Exam Conditions**

Closed 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