



# CHEM13081 *Biomaterials: Environmental and Medical Applications*

## Term 2 - 2021

Profile information current as at 29/04/2024 07:22 am

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. You will be introduced to the materials science of metals, ceramics, polymers and composites, and the engineering principles behind biomaterial design. You will also discuss the medical and environmental applications of biomaterials, such as biomedical engineering, bioactive polymers and antifouling biofilms.

### 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

Prerequisite: CHEM11041 Chemistry for the Life Sciences or CHEM11043 Atoms, Molecules and Matter or CHEM11044 Chemical Reactions

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 - 2021

- 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. **Research Proposal**

Weighting: 15%

#### 2. **Research Assignment**

Weighting: 35%

#### 3. **Take Home Exam**

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 Student Unit and Teaching Evaluation (SUTE)

##### Feedback

Students highlighted that the major assessment for this Unit was focused on a research proposal and writing a scientific manuscript in the format of either the journal Biomaterials Science or the Journal of Chemical Education. Those CC13 students who had completed a chemistry minor were required to take only three basic chemistry specific subjects within their whole degree. As such, research proposal and writing a scientific manuscript in the above-mentioned format remains beyond their level of competency.

##### Recommendation

In the next offering, the major assessment item will be reviewed to ensure it is relevant for the different cohorts studying the unit.

## 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. Evaluate the use of biomaterials and devices constructed with biomaterials
4. Assess the compatibility of biomaterials in health and environmental disciplines and apply the appropriate compatibility requirements to real world applications.
5. Discuss the responses of living tissues to implanted biomaterials

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

## Alignment of Learning Outcomes, Assessment and Graduate Attributes



### Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes				
	1	2	3	4	5
1 - Practical Assessment - 15%		•	•		
2 - Written Assessment - 35%		•	•	•	
3 - Take Home Exam - 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 - 35%	•	•		•		•	•	•		
3 - Take Home Exam - 50%	•	•	•							

## Textbooks and Resources

### Textbooks

CHEM13081

#### Prescribed

##### Introduction to Biomaterials

Edition: 2 (2011)

Authors: Jeffrey O. Hollinger (Editor)

CRC Press

Binding: eBook

#### 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.

### 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

**Ty Jones** Unit Coordinator  
[t.h.jones@cqu.edu.au](mailto:t.h.jones@cqu.edu.au)

## Schedule

### Week 1 - 12 Jul 2021

Module/Topic	Chapter	Events and Submissions/Topic
Introduction to Biomaterials - History - Potential		Students should start to form groups for their group assessments.

### Week 2 - 19 Jul 2021

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

### Week 3 - 26 Jul 2021

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

**Week 4 - 02 Aug 2021**

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 submitted to Moodle by 3 pm AEST, Friday, August 6th, 2021.

**Week 5 - 09 Aug 2021**

Module/Topic	Chapter	Events and Submissions/Topic
Surface modification of Biomaterials		Submit assessment 1 - Research Proposal  <b>Assessment 1 (Practical and Written) - linked with assessment 2</b> Due: Week 5 Friday (13 Aug 2021) 11:55 pm AEST

**Vacation Week - 16 Aug 2021**

Module/Topic	Chapter	Events and Submissions/Topic
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**Week 6 - 23 Aug 2021**

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

**Week 7 - 30 Aug 2021**

Module/Topic	Chapter	Events and Submissions/Topic
Systematic Research Experimental Review		Residential School - Rockhampton North campus 30th August - 1st September 2021.

**Week 8 - 06 Sep 2021**

Module/Topic	Chapter	Events and Submissions/Topic
Biosensors		

**Week 9 - 13 Sep 2021**

Module/Topic	Chapter	Events and Submissions/Topic
Biomaterials for medical applications - Drug Delivery		<b>Assessment 2 (Written) - linked with Assessment 1 Due: Week 9 Friday (17 Sep. 2021) 11:55 pm AEST</b>  <b>Assessment 2 (Written) - Linked with Assessment 1</b> Due: Week 9 Friday (17 Sep 2021) 11:55 pm AEST

**Week 10 - 20 Sep 2021**

Module/Topic	Chapter	Events and Submissions/Topic
Biomaterials for medical applications - Tissue generation		<b>Assessment 3 (Written)</b> Due: Week 11 Monday (27 September 2021) 11:55 pm AEST.

**Week 11 - 27 Sep 2021**

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

**Week 12 - 04 Oct 2021**

Module/Topic	Chapter	Events and Submissions/Topic
Biomaterials for environmental applications		
<b>Review/Exam Week - 11 Oct 2021</b>		
Module/Topic	Chapter	Events and Submissions/Topic
<b>Exam Week - 18 Oct 2021</b>		
Module/Topic	Chapter	Events and Submissions/Topic
		<b>Take Home Assessment/Exam</b> Due: Exam Week Monday (18 Oct 2021) 11:45 pm AEST

## Assessment Tasks

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

#### Assessment Type

Research Proposal

#### Task Description

Assessment 1 & Assessment 2 are group assessments for the research topic that you have chosen from self-allocated topic choices with your group members. You are required to perform the following tasks for this assessment with your chosen topic:

- Design a research experimental proposal (500 -1000 words),
- Conduct your proposed experiment during the residential school in week 7.

Assessment 1: Practical and written assessment is comprised of three parts:

- Part A: Build your equipment and consumables list and submit via Moodle (2% weighting) - Due week 4, **Friday, 6 August 2021, 23:55 PM (QLD Time)**.
- Part B: Submit your Experimental Proposal via Moodle (10% weighting) - Due week 5, Friday, **13 August 2021, 23:55 PM (QLD Time)**. Word Count requirements: 500 - 1000 words.
- Part C: Your individual component (3% weighting) has two requirements: Statement of each team member's role, contribution and responsibility (1% weighting); Self & Peer Assessment (SPA) and Self Evaluation (2% weighting) - Due week 5, **Friday, 13 August 2021, 23:55 PM (QLD Time)**.

You are required to conduct your experiment during the residential school in Week 7: **Monday 30 August - Wednesday 1 September 2021.**

In order to conduct your experiment, the equipment and resources proposed for the experimental design task must be available in the laboratory. To ensure this, please liaise with your unit coordinator and technical staff associated with CHEM13081 or check the Rockhampton Laboratory Equipment List on Moodle.

To ensure you have the equipment for your experimental proposal, you are required to complete an Excel list of consumables (chemicals), glassware (with size and number required) and instrumentation, and submit your list on Moodle by 23:55 pm AEST, **Friday, August 6th, 2021.**

Refer to the Assessment 1 Task Description document available on Moodle's Assignment 1 for more details of each part's requirements and the marking rubric.

#### Assessment Due Date

Week 5 Friday (13 Aug 2021) 11:55 pm AEST

Submissions must be uploaded via the CHEM13081 Moodle site and must be in MS Word format.

#### Return Date to Students

14 days after submission with feedback via Moodle.

#### Weighting

15%

#### Minimum mark or grade

50%

#### Assessment Criteria

#### General Guidelines

- Your experimental research proposal should be coherent, be well structured, and all external sources must be cited in the correct format (Vancouver).
- Text should be word-processed, with appropriate layout and use of headings/sub-headings.
- Tables and figures should be used to illustrate specific aspects of your work.
- Figures and tables should be correctly labelled.
- The references should be listed at the end of the assessment.
- Please avoid images with very large file sizes as this will make your proposal too large to upload/download.

All submissions must be typed and should be made in electronic format, and be submitted through the assessment link in Moodle, by uploading your file following the on-screen instructions. You must submit the assessment by uploading word document(s) ( i.e. .doc or .docx), through the Moodle site. Mac users should ensure that the file name has '.doc' or '.docx' for word files.

### Marking Criteria

Adheres to Appendix A - Marking Rubric of Assessment 1 - Task Description available on Moodle.

### Referencing Style

- [Vancouver](#)

### Submission

Online Group

### Submission Instructions

Upload assessment in WORD FORMAT by following the instructions on the Moodle site for CHEM13081.

### Learning Outcomes Assessed

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

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

### Assessment Type

Research Assignment

### Task Description

This is a group assessment. It is comprised of two components (35% total weighting): i) team component and ii) individual component

**i) Team component (30% weighting):** You are required to report your findings from their experimental design during their residential school (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. Refer to Moodle for more information about assessment 2 - Task Description and marking rubric (Appendix B). Adherence to the marking rubric is a part of the Assessment Criteria for this task.

Word Count: 1000 – 2500 words

**ii) Individual component (5% weighting):** is composed of two tasks - Individual Practical Skills Set at the residential schools & Self-Reflection Statement. You are required to complete and submit the following tasks:

- Students' individual practical skills (2.5% weighting) will be assessed during the residential school (please refer to Appendix C on Moodle site for marking rubric requirements).
- Self-Reflection Statement (2.5% weighting): 100 to 200 words (please see the Moodle site for the task description).

### Assessment Due Date

Week 9 Friday (17 Sept 2021) 11:55 pm AEST

Submissions via the Moodle site for CHEM13081 and must be in MS Word format

### Return Date to Students

Week 12 Monday (4 Oct 2021)

14 days after submission with feedback via the unit Moodle - CHEM13081 site



**Weighting**

35%

**Minimum mark or grade**

50%

**Assessment Criteria**

A full journal assessment marking rubrics (Appendix B) will be available on the unit Moodle site, using the following criteria:

- Adheres to Appendix B on Moodle.
- Presentation's journal article adherence to Biomaterials Science guidelines or Journal of Chemical Education & clarity of expression.

A complete assessment marking rubric for individual practical skills set at the residential school on the unit Moodle (Appendix C), using the three main criteria:

- Process of science.
- Laboratory techniques and skills.
- Community practice aspects of science.

**Referencing Style**

- [Vancouver](#)

**Submission**

Online Group

**Submission Instructions**

Upload assessment in WORD FORMAT by following the instructions on the Moodle site for CHEM13081.

**Learning Outcomes Assessed**

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

### 3 Take Home Assessment/Exam

**Assessment Type**

Take Home Exam

**Task Description**

The assessment will be a written take-home exam. It will cover the content you have studied during this term. This assessment is designed to assess your comprehension of the concepts presented in the unit through their application to answer a series of questions. It will be made available via Moodle site during the university's standard exam period. Further details will be provided through Moodle.

**Assessment Due Date**

Exam Week Monday (18 Oct 2021) 11:45 pm AEST

Take-Home assessment - Date and time to be advised on Moodle.

**Return Date to Students**

Exam Week Monday (18 Oct 2021)

Moodle Marks will be returned via Moodle 14 days after the Take-Home Exam is submitted.

**Weighting**

50%

**Minimum mark or grade**

50%

**Assessment Criteria**

Marks will be awarded for each question as indicated in the assessment item. All submissions should be typed and saved and submitted via Moodle site as a Microsoft Word document.

**Referencing Style**

- [Vancouver](#)

**Submission**

Online

**Submission Instructions**

Submissions must be in MS Word format on the unit Moodle - CHEM13081 Site

**Learning Outcomes Assessed**

- Describe the various types of biomaterials and the principles of biomaterial design and development
- Evaluate the use 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**

- Communication
- Problem Solving
- Critical Thinking

## 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