



CHEM13081 *Biomaterials: Environmental and Medical Applications*

Term 2 - 2024

Profile information current as at 29/07/2024 05:47 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. 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 - 2024

- 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).

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. **Report**

Weighting: 20%

2. **Written Assessment**

Weighting: 40%

3. **Take Home Exam**

Weighting: 40%

Assessment Grading

This is a graded unit: your overall grade will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. You must obtain an overall mark for the unit of at least 50%, or an overall grade of 'pass' in order to pass the unit. If any 'pass/fail' tasks are shown in the table above they must also be completed successfully ('pass' grade). You must also meet any minimum mark requirements specified for a particular assessment task, as detailed in the 'assessment task' section (note that in some instances, the minimum mark for a task may be greater than 50%). Consult the [University's Grades and Results Policy](#) for more details of interim results and final grades.

CQUniversity Policies

All University policies are available on the [CQUniversity Policy site](#).

You may wish to view these policies:

- Grades and Results Policy
- Assessment Policy and Procedure (Higher Education Coursework)
- Review of Grade Procedure
- Student Academic Integrity Policy and Procedure
- Monitoring Academic Progress (MAP) Policy and Procedure – Domestic Students
- Monitoring Academic Progress (MAP) Policy and Procedure – International Students
- Student Refund and Credit Balance Policy and Procedure
- Student Feedback – Compliments and Complaints Policy and Procedure
- Information and Communications Technology Acceptable Use Policy and Procedure

This list is not an exhaustive list of all University policies. The full list of University policies are available on the [CQUniversity Policy site](#).

Previous Student Feedback

Feedback, Recommendations and Responses

Every unit is reviewed for enhancement each year. At the most recent review, the following staff and student feedback items were identified and recommendations were made.

Feedback from SUTE

Feedback

Usefulness of the knowledge and skills is not clear.

Recommendation

To demonstrate the usefulness of the knowledge and skills more clearly, and amidst an impending combination of the Unit with another, we will: 1. Provide relevant, contextualised examples in the content to demonstrate the usefulness of the content and the subject. 2. Review whether the current assessment structure can be improved to enable the students to obtain useful knowledge and skills.

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 CU18 (Bachelor of Science) - currently under consideration.

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 - Report - 20%			•		
2 - Written Assessment - 40%		•		•	
3 - Take Home Exam - 40%	•				•

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					

Textbooks and Resources

Textbooks

CHEM13081

Prescribed

Introduction to Biomaterials

2nd edition (2011)

Authors: Jeffrey O. Hollinger (Editor)

CRC Press (Taylor & Francis)

London , UK

ISBN: 781439812563

Binding: eBook

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

Shaneel Chandra Unit Coordinator
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Schedule

Week 1 - 08 Jul 2024

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

Week 2 - 15 Jul 2024

Module/Topic	Chapter	Events and Submissions/Topic
Biomaterials Surfaces: Physics - Surface properties and cell adhesion		

Week 3 - 22 Jul 2024

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

Week 4 - 29 Jul 2024

Module/Topic	Chapter	Events and Submissions/Topic
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Biomaterials Surfaces: Bio-chemistry
- Protein interaction
- Cell-surface interaction

Assessment 1: Biomaterials Report Due: Week 4 Wednesday (31 July 2024) 11:59 pm AEST

Week 5 - 05 Aug 2024

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

Vacation Week - 12 Aug 2024

Module/Topic	Chapter	Events and Submissions/Topic
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Week 6 - 19 Aug 2024

Module/Topic	Chapter	Events and Submissions/Topic
Biomaterials and Nanomaterials		Assessment 2: Written Task Due: Week 6 Wednesday (21 Aug 2024) 11:59 pm AEST

Week 7 - 26 Aug 2024

Module/Topic	Chapter	Events and Submissions/Topic
Biosensors		

Week 8 - 02 Sep 2024

Module/Topic	Chapter	Events and Submissions/Topic
Biomaterials for medical applications - Drug Delivery		

Week 9 - 09 Sep 2024

Module/Topic	Chapter	Events and Submissions/Topic
Biomaterials for medical applications - Tissue generation		

Week 10 - 16 Sep 2024

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

Week 11 - 23 Sep 2024

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

Week 12 - 30 Sep 2024

Module/Topic	Chapter	Events and Submissions/Topic
		Assessment 3: Take Home exam Due: Week 12 Tuesday (1 Oct 2024) 9:00 am AEST

Review/Exam Week - 07 Oct 2024

Module/Topic	Chapter	Events and Submissions/Topic
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Exam Week - 14 Oct 2024

Module/Topic	Chapter	Events and Submissions/Topic
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Assessment Tasks

1 Assessment 1: Biomaterials Report

Assessment Type

Report

Task Description

Biomaterials are synthetic materials used to make devices to replace part of a living system or to function in intimate contact with living tissue. They lie at the boundary between science and engineering as well as biology / physiology and the clinical sciences. In Assessment 1, you will conduct research to review (at least two) biomaterials published in credible scientific journals. In doing so, you will aim to better understand the main aspects of biomaterial development and implementation. You will then present this information in the form of Power Point slides on which you will voice-over, record it as a video and submit the video **not exceeding 5 min length** that summarizes your findings, reviews the chosen references and demonstrates your understanding of key biomaterial principles. Your chosen biomaterial must come from either polymers, metals or ceramics.

Additional details and instructions will be provided via the Unit's Moodle site.

Assessment Due Date

Week 4 Wednesday (31 July 2024) 11:59 pm AEST

To be submitted via Moodle

Return Date to Students

Week 6 Wednesday (21 Aug 2024)

Returned with feedback via Moodle

Weighting

20%

Minimum mark or grade

50%

Assessment Criteria

- Relevance, reliability and depth of reviewed literature (including correct referencing) - 25%
- Demonstrated understanding of key biomaterial concepts - 25%
- Slide content and layout - 25%
- Presentation delivery - 25%

Referencing Style

- [Vancouver](#)

Submission

Online

Submission Instructions

Presentation video should be submitted via Moodle as an .mp4 file.

Learning Outcomes Assessed

- Evaluate the use of biomaterials and devices constructed with biomaterials

2 Assessment 2: Written Task

Assessment Type

Written Assessment

Task Description

In this Assessment, you will write a short commentary on applications of biomaterials to electrochemical sensors (biosensors). It is an opportunity for you to demonstrate your understanding of the vast biomaterial applications that have been developed, trialled and applied globally. There is a myriad of biomaterial applications that can be discussed in this task. It must be a standalone discussion and not continue from or be a duplication of Assessment 1.

Word limits are a critical aspect of writing, whether it is for an audience of scientific experts and peers, or for a general audience. They help ensure that the compiled material is succinct, minimise repetition and readable. To help you adhere to these expectations, Assessment 2 has a word limit of 1500 ± 250 words, excluding the abstract and the references cited at the end.

Assessment Due Date

Week 6 Wednesday (21 Aug 2024) 11:59 pm AEST
To be submitted via Moodle

Return Date to Students

Week 9 Friday (13 Sept 2024)
Returned with feedback via Moodle

Weighting

40%

Minimum mark or grade

50%

Assessment Criteria

A detailed set of marking rubrics will be made available on Moodle.

Referencing Style

- [Vancouver](#)

Submission

Online

Submission Instructions

To be submitted via Moodle

Learning Outcomes Assessed

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

3 Assessment 3: Take Home exam

Assessment Type

Take Home Exam

Task Description

Assessment Task 3 - Take Home Exam, will cover content you have studied this term. This assessment will be in the form of a written assessment. The assessment will be will be timed. You will have 2 hours to complete the assessment during the allocated period of 24 hours which end as stated in the **Due Date Information** below.

In completing this assessment, you should note the following:

- Attempt all questions
- All submissions should be typed and saved as a Microsoft Word document
- Show all calculations and detailed workings as required
- Completed assessment is to be submitted via upload on Moodle page.

The breakdown of topics to be covered in Assessment Task 3 will be made available on Moodle prior to the Take Home Exam date.

Assessment Due Date

Week 12 Tuesday (1 Oct 2024) 9:00 am AEST

You will have 2 hours to complete the assessment within the allocated 24-hour testing period. Submission as a Word file, via Moodle.

Return Date to Students

Review/Exam Week Tuesday (8 Oct 2024)
Returned with feedback via Moodle

Weighting

40%

Minimum mark or grade

50%

Assessment Criteria

Marks will be awarded for each question as indicated in the assessment item e.g., correct explanation, correct calculations and answers.

Where applicable, show all working or reasoning for answers, correct units, correct formula, clear and correct diagrams.

Referencing Style

- [Vancouver](#)

Submission

Online

Learning Outcomes Assessed

- Describe the various types of biomaterials and the principles of biomaterial design and development
- Discuss the responses of living tissues to implanted biomaterials.

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