CHEM13081 *Biomaterials: Environmental and Medical Applications*
Term 2 - 2022

Profile information current as at 07/02/2023 10:03 pm

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 - 2022

- 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. **Practical Assessment**
Weighting: 15%
2. **Written Assessment**
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 Have Your Say

Feedback

Students commented that opportunity to complete a mini research project from the ground up was absolutely amazing and the teaching was done well.

Recommendation

Endeavor to maintain and update the research project and teaching materials for the next offering.

Feedback from Have Your Say

Feedback

Some students commented that this unit should not be a part of the Bachelor of Agriculture course as they thought it teaches medical content rather than content relevant to agriculture.

Recommendation

Consult with staff from the appropriate discipline. This unit is offered in the Chemistry minor for the Bachelor of Agriculture. The unit content and assessment will be modified to accommodate students from the Bachelor of Agriculture if necessary.

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 compatability 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

— 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 - 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
2nd edition (2011)
Authors: Jeffrey O. Hollinger (Editor)
CRC Press (Taylor & Francis)
London , UK
Binding: eBook

Additional Textbook Information
Both paper and eBook copies can now be purchased 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

Ty Jones Unit Coordinator
t.h.jones@cqu.edu.au

Schedule

Week 1 - 11 Jul 2022

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

Week 2 - 18 Jul 2022

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 - 25 Jul 2022

Module/Topic	Chapter	Events and Submissions/Topic

Biomaterials Surfaces: Chemistry - Chemisorption on metals and oxides - Aqueous corrosion of metals - Polymer		

Week 4 - 01 Aug 2022

Module/Topic	Chapter	Events and Submissions/Topic
Biomaterials Surfaces: Bio-chemistry - Protein interaction - Cell-surface interaction		Assessment 1: Research Proposal (Part A) Due: Friday, August 5th 2022.23:55pm AEST.

Week 5 - 08 Aug 2022

Module/Topic	Chapter	Events and Submissions/Topic
Surface modification of Biomaterials		Assessment 1 - Research Proposal (Part B & C) Due: Week 5 (Friday, 12th August 2022 at 23:55 PM AEST). **Practical Assessment** Due: Week 5 Friday (12 Aug 2022) 11:55 pm AEST

Vacation Week - 15 Aug 2022

Module/Topic	Chapter	Events and Submissions/Topic

Week 6 - 22 Aug 2022

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

Week 7 - 29 Aug 2022

Module/Topic	Chapter	Events and Submissions/Topic
Systematic Research Experimental Review		Residential School - Rockhampton North campus 29th August – 31st August 2022.

Week 8 - 05 Sep 2022

Module/Topic	Chapter	Events and Submissions/Topic
Biosensors		

Week 9 - 12 Sep 2022

Module/Topic	Chapter	Events and Submissions/Topic
Biomaterials for medical applications - Drug Delivery		Assessment 2 (Written) – linked with Assessment 1 Due: Week 9 (Friday, 16th September 2022 at11:55 pm AEST).

Week 10 - 19 Sep 2022

Module/Topic	Chapter	Events and Submissions/Topic
Biomaterials for medical applications - Tissue generation		Assessment 3 (Written) Due: Week 11 Monday (26 September 2022) at 11:55 pm AEST.

Week 11 - 26 Sep 2022

Module/Topic	Chapter	Events and Submissions/Topic

Biomaterials for medical applications - Medical devices.		Assessment 2: Written Assessment (Complete a Scientific Article). Due: Monday, 26 September 2022, 23:55PM AEST. **Biomaterials Science Article** Due: Week 11 Monday (26 Sept 2022) 11:55 pm AEST

Week 12 - 03 Oct 2022

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

Review/Exam Week - 10 Oct 2022

Module/Topic	Chapter	Events and Submissions/Topic

Exam Week - 17 Oct 2022

Module/Topic	Chapter	Events and Submissions/Topic
		Take Home Assessment/Exam Due: Exam Week Monday (17 Oct 2022) 12:00 am AEST

Assessment Tasks

1 Practical Assessment

Assessment Type
Practical Assessment

Task Description
Assessment 1 and 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 1 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 (15% weighting) is comprised of three parts:

- Part A: Equipment and consumables list, submit via Moodle (2% weighting) - Due week 4, Friday, 5 August 2022, 23:55 PM (AEST).
- Part B: Experimental Proposal, submit via Moodle (10% weighting) - Due week 5, Friday, 12 August 202, 23:55 PM (AEST).
- Part C: Individual component (3% weighting): 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, 12 August 202, 23:55 PM (AEST).

The experiment will be conducted as part of the residential school during Week 7: **Thursday, 1 September 2022 - Saturday, 3 September 2022.**
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 or your assessment 1-Part A on Moodle by the due date **Friday, 5 August 2022, 23:55 PM (AEST).**
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 (12 Aug 2022) 11:55 pm AEST
For more details refer to the unit Moodle site CHEM13081 and for Part A's Due Date.

Return Date to Students
Week 7 Friday (2 Sept 2022)
Within two weeks after submission or due day.

Weighting
15%

Minimum mark or grade
50%

Assessment Criteria
The assessment criteria for group assessment will be based on the Assessment Policy and Procedure (Higher Education Coursework).
Assessment 1's assessment criteria include two parts: Team contribution and individual contribution.
Team contribution's assessment criteria comprise a brief background of the research issue, presentation of the research idea, hypothesis, scientific methodology and approach to investigating the problem of students' experimental designs.
Individual contribution assessment criteria cover a clear define statement of each member's role of the project and a self and peer assessment.
Marks will be awarded for each component as described in the marking rubric to ensure fairness, equity, consistency and transparency.

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

Graduate Attributes

- Critical Thinking
- Team Work
- Cross Cultural Competence
- Ethical practice

2 Biomaterials Science Article

Assessment Type
Written Assessment

Task Description
This is a group assessment that continues with assessment 1. 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 write a full Biomaterials scientific article reporting 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).
Due Date Information
This written assessment is about the completion of writing a full Biomaterial Scientific Article that you have chosen for your research topic in Assessment 1 with your group. More details about this task are available on Moodle site.

Assessment Due Date
Week 11 Monday (26 Sept 2022) 11:55 pm AEST

For more details refer to the unit Moodle site CHEM13081.

Return Date to Students
Week 12 Friday (7 Oct 2022)
Within a week after submission or due day.

Weighting
35%

Minimum mark or grade
50%

Assessment Criteria
The written assessment criteria include two parts: Team component assessment and individual component assessment.
1. Team component assessment criteria will be assessed according to the marking rubric criteria published on Moodle: Abstract, introduction, literature review, experimental design, results and discussion, conclusion, and presentation adherence to Biomaterial Science Guideline or Journal of Chemical Education and Clarity of Expression.
General Guidelines for your scientific manuscript:

- 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.
2. Individual component assessment criteria have two parts: a) The Individual practical skills set at the residential school and b) the Self-Reflection Statement.
Marking Criteria
Adheres to Appendix A - Marking Rubric of Assessment 1 - Task Description available on Moodle.
Marks will be allocated and awarded for each component as described in the marking rubric criteria to ensure fairness, equity, consistency and transparency.

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 compatability requirements to real world applications.

Graduate Attributes

- Communication
- Problem Solving
- Information Literacy
- Information Technology Competence
- Cross Cultural Competence
- Ethical practice

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 (17 Oct 2022) 12:00 am AEST
Take-Home assessment - Date and time to be advised on Moodle.

Return Date to Students

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 or PDF File.

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
- Discuss the responses of living tissues to implanted biomaterials

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