

# BIOM9333

Cellular and Tissue Engineering

Term 3, 2021

***CELLULAR AND TISSUE ENGINEERING***  
**BIOM9333**

## Course Overview

### Staff Contact Details

#### Convenors

Name	Email	Availability	Location	Phone
Megan Lord	<a href="mailto:m.lord@unsw.edu.au">m.lord@unsw.edu.au</a>	by appointment	Room 505, Level 5 Samuels Building	+61293853 910

### School Contact Information

Student Services can be contacted via [unsw.to/webforms](https://unsw.to/webforms).

## Course Details

### Units of Credit 6

### Summary of the Course

This course outlines the concepts of cell-based products for the pharmaceutical and medical device industries. This course will cover the basis of how biologics (eg protein and carbohydrate drugs and antibodies) are produced by cells; recombinant technologies to produce biologics from bacterial and mammalian systems; process design and optimisation for the production of biologics; case studies of commercial biologics; cell therapies; the principles of tissue engineering and regenerative medicine, including biomaterials, cells and growth factors, and the clinical application of these principles in various tissues.

### Course Aims

The aim of this course is to develop an understanding of the principles of engineering cells and apply this knowledge to design processes to produce biologics for the pharmaceutical market or tissue engineered/regenerative medicine medical devices.

### Course Learning Outcomes

After successfully completing this course, you should be able to:

Learning Outcome	EA Stage 1 Competencies
1. Describe the principles of cellular and tissue engineering/regenerative medicine.	PE1.1, PE1.3, PE1.6, PE1.2
2. Apply the principles of cellular and tissue engineering/regenerative medicine to theoretically develop processes for the production of medical devices containing cells and/or biologics.	PE2.2
3. Synthesise, compare and evaluate scientific literature, technical reports and presentations.	PE1.4
4. Communicate effectively in a professional environment through technical reports and presentations	PE3.2, PE3.6

### Teaching Strategies

A combination of lessons, activities and workshops are used in this course to expose you to a range of teaching modes, including passive and active participation. The lessons and activities are paced throughout the course offering a chance to engage in spaced practice to enable time to form connections between the ideas and concepts explored in this course so that knowledge can be built upon and recalled later, the essence of long-term learning. In addition, this course makes use of a teaching technique called retrieval practice. This approach encourages continuous recall of information, challenging memory and understanding of a concept by reviewing what you know and encouraging you to keep on learning. This approach is exemplified in the activities and assessment tasks.

Feedback is an important teaching strategy utilised in this course. Instant feedback is provided during the activities and lessons while feedback on assessment tasks will be provided within 2 weeks with detailed marking guides provided to assist you in understanding your learning progress. In addition, weekly Question and Answer (Q&A) sessions during the workshops will assist with learning.

### **Additional Course Information**

Lessons are completed in your own time while the workshops are held during class time to consolidate your understanding of the lessons, receive help to complete the activities and work on the team major project.

## Assessment


The assessments have been designed to measure your achievement of the learning outcomes.

*Students who perform poorly in the weekly progress tasks are recommended to discuss progress with the Course Convenor during the term.*

*The final grade for this course will normally be based on the sum of the scores from each of the assessment tasks. The Course Convenor reserves the right to adjust the final scores by scaling if agreed by the Head of School.*

Late submissions will be penalised 10% of the mark for each calendar day late. If you foresee a problem in meeting the nominated submission date, please contact the Course Convenor to discuss your situation as soon as possible.

Assessment marks and feedback will be available on Moodle as soon as they have been marked, which will usually be within 2 weeks of submission.

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Weekly Progress	15%	Refer to due dates in Moodle	1, 2
2. Individual Tasks	30%	Refer to due dates in Moodle	2, 3, 4
3. Quizzes	30%	Refer to due dates in Moodle	1, 2, 3, 4
4. Major Project 	20%	Refer to due dates in Moodle	2, 3, 4
5. Peer review	5%	21/11/2021 11:55 PM	3

### Assessment 1: Weekly Progress

**Due date:** Refer to due dates in Moodle

**Assessment Outline:** This continuous assessment is designed to encourage you to keep up to date with the course content throughout the term. You will receive a maximum of 1% of the total course assessment by completing the lessons and activities set out for each week as per the course outline if you complete the designated module by the end of the weekend (Sunday, 11:55 pm) each week.

Note you can attempt the lessons and activities multiple times. There are 15 lessons and activities to complete.

### Assessment 2: Individual Tasks

**Due date:** Refer to due dates in Moodle

**Assessment Outline:** Three Individual Tasks (3), 10% each, will provide you with an opportunity to apply the theory you learned in the weekly lessons.

### **Assessment 3: Quizzes**

**Due date:** Refer to due dates in Moodle

**Assessment outline:**

The **Mid-term Quiz** is designed to consolidate and apply the theory you have learned in the first 4 weeks of class. The quiz will contain multiple choice, true/false and fill in the blank questions. This is an open book quiz. It is designed to take approximately 30 minutes to complete.

The **Final Exam** is an individual task designed to consolidate and apply the theory you have learned throughout the course. The quiz will contain multiple choice, true/false, fill in the blank and short answer questions. This is an open book quiz. It is designed to take approximately 2 hours to complete.

### **Assessment 4: Major Project (Group)**

**Due date:** Refer to due dates in Moodle

**Assessment outline:** The major project will see you prepare a short report and a presentation in a group on the design a tissue engineered or regenerative medicine product utilising a bioactive. This will be assessed in multiple parts: Milestone 1 (1%; due week 3), Milestone 2 (1%; due week 5), Video presentation (9%, due week 9), Report (8%; due week 9) and Group contribution reflection (1%, due week 10).

### **Assessment 5: Peer review**

**Due date:** 21/11/2021 11:55 PM

**Assessment outline:** Peer review of group presentations will provide you with a chance to develop your critical review skills.

## Attendance Requirements

Students are strongly encouraged to complete the lessons in their own time and attend the workshops each week.

## Course Schedule

[View class timetable](#)

### Timetable

Date	Type	Content
Week 1: 13 September - 17 September	Topic	<b>Principles of Tissue engineering and regenerative medicine (TERM) I</b>
	Module	Complete Lesson 1 in Moodle in your own time.
	Workshop	Attend class to experience: <ol style="list-style-type: none"> <li>1. Course Introduction</li> <li>2. Consolidation of Lesson 1</li> <li>3. Activity 1</li> <li>4. Q&amp;A</li> </ol>
	Assessment	Complete the following by Sunday 11:55 pm on Moodle: <ol style="list-style-type: none"> <li>1. Weekly progress quiz for Lesson 1 (1%)</li> <li>2. Weekly progress quiz for Activity 1 (%)</li> </ol>
Week 2: 20 September - 24 September	Topic	<b>Principles of TERM II</b>
	Module	Complete Lesson 2 in Moodle in your own time.
	Workshop	Attend class to experience: <ol style="list-style-type: none"> <li>1. Consolidation of Lesson 2</li> <li>2. Activity 2</li> <li>3. Q&amp;A</li> </ol>
	Assessment	Complete the following by Sunday 11:55 pm on Moodle: <ol style="list-style-type: none"> <li>1. Weekly progress quiz for Lesson 2 (1%)</li> <li>2. Weekly progress quiz for Activity 2 (%)</li> </ol>
Week 3: 27 September	Topic	<b>Principles of TERM III</b>

- 1 October	Module	Complete Lesson 3 in Moodle in your own time.
	Workshop	Attend class to experience: <ul style="list-style-type: none"> <li>1. Consolidation of Lesson 3</li> <li>2. Activity 3</li> <li>3. Q&amp;A</li> <li>4. Major Project Session I</li> </ul>
	Assessment	Complete the following by Sunday 11:55 pm on Moodle: <ul style="list-style-type: none"> <li>1. Weekly progress quiz for Lesson 3 (1%)</li> <li>2. Weekly progress quiz for Activity 3 (1%)</li> <li>3. Tissue Engineering Task (10%)</li> <li>4. Major Project Milestone I (1%; group task)</li> </ul>
Week 4: 4 October - 8 October	Topic	<b>Recombinant protein expression I</b>
	Module	Complete Lesson 4 in Moodle in your own time.
	Workshop	Attend class to experience: <ul style="list-style-type: none"> <li>1. Consolidation of Lesson 4</li> <li>2. Activity 4</li> <li>3. Q&amp;A</li> </ul>
	Assessment	Complete the following by Sunday 11:55 pm on Moodle: <ul style="list-style-type: none"> <li>1. Weekly progress quiz for Lesson 4 (1%)</li> <li>2. Weekly progress quiz for Activity 4 (%)</li> </ul>
Week 5: 11 October - 15 October	Topic	<b>Recombinant protein expression II</b>
	Module	Complete Lesson 5 in Moodle in your own time.
	Workshop	Attend class to experience: <ul style="list-style-type: none"> <li>1. Consolidation of Lesson 5</li> <li>2. Activity 5</li> <li>3. Q&amp;A</li> <li>4. Major Project Session II</li> </ul>
	Assessment	Complete the following by Sunday 11:55 pm on Moodle: <ul style="list-style-type: none"> <li>1. Weekly progress quiz for Lesson 5 (1%)</li> <li>2. Weekly progress quiz for Activity 5 (%)</li> <li>3. Mid-term Quiz (10%)</li> <li>4. Major Project Milestone II (1%; group task)</li> </ul>



Week 6: 18 October - 22 October		
Week 7: 25 October - 29 October	Topic	<b>Production of bioactives I</b>
	Module	Complete Lesson 6 in Moodle in your own time.
	Workshop	Attend class to experience: <ul style="list-style-type: none"> <li>1. Consolidation of Lesson 6</li> <li>2. Activity 6</li> <li>3. Q&amp;A</li> </ul>
	Assessment	Complete the following by Sunday 11:55 pm on Moodle: <ul style="list-style-type: none"> <li>1. Weekly progress quiz for Lesson 6 (1%)</li> <li>2. Weekly progress quiz for Activity 6 (%)</li> <li>3. Recombinant protein task (10%)</li> </ul>
Week 8: 1 November - 5 November	Topic	<b>Production of bioactives II</b>
	Module	Complete Lesson 7 in Moodle in your own time.
	Workshop	Attend class to experience: <ul style="list-style-type: none"> <li>1. Consolidation of Lesson 7</li> <li>2. Activity 7</li> <li>3. Q&amp;A</li> <li>4. Major Project Session III</li> </ul>
	Assessment	Complete the following by Sunday 11:55 pm on Moodle: <ul style="list-style-type: none"> <li>1. Weekly progress quiz for Lesson 7 (1%)</li> <li>2. Weekly progress quiz for Activity 7 (%)</li> </ul>
Week 9: 8 November - 12 November	Workshop	Attend class to experience: <ul style="list-style-type: none"> <li>1. Activity 8</li> <li>2. Q&amp;A</li> </ul>
	Assessment	Complete the following by Sunday 11:55 pm on Moodle: <ul style="list-style-type: none"> <li>1. Weekly progress quiz for Activity 8 (%)</li> <li>2. Major Project Report (8%; group task)</li> <li>3. Major Project Presentation (9%; group task)</li> </ul>
Week 10: 15 November - 19 November	Workshop	Attend class to experience: <ul style="list-style-type: none"> <li>1. Course Q&amp;A</li> <li>2. Revision</li> </ul>

	Assessment	Complete the following by Sunday 11:55 pm on Moodle:  <ol style="list-style-type: none"><li>1. Bioprocessing Task (10%)</li><li>2. Major Project Peer Review (5%)</li><li>3. Major Project Group Contribution Reflection (1%; group task)</li></ol>
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## Resources

### Recommended Resources

- A short guide to writing about biology, global edition by Jan Pechenik.

### Course Evaluation and Development

Student feedback has helped to shape and develop this course, including feedback obtained from on-line evaluations as part of myExperience.

The course underwent a major revision in 2020 with changes including reordering of the content delivered, revision to the course content and inclusion of major project sessions to assist with the timely and focused development of the major project. For the first time, all course content is designed for online access with instant feedback incorporated into all lessons and activities. Further developments of 2021 have included revision of the course content and assessments and provisions to ask anonymous questions which will be responded to in the Discussion forum in Microsoft Teams.

Previous students in the class provided feedback including '*Very interesting course and well organised.*', '*The activities were engaging, enjoyable, required critical thinking and were well integrated into the course.*'

## Submission of Assessment Tasks

Laboratory reports and major assignments will require a [Non Plagiarism Declaration Cover Sheet](#).

Late submissions will be penalised 10% of the mark for each calendar day late. If you foresee a problem in meeting the nominated submission date please contact the Course Convenor to make an appointment to discuss your situation as soon as possible.

## Academic Honesty and Plagiarism

### PLAGIARISM

Beware! An assignment that includes plagiarised material will receive a 0% Fail, and students who plagiarise may fail the course. Students who plagiarise will have their names entered on a plagiarism register and will be liable to disciplinary action, including exclusion from enrolment.

It is expected that all students must at all times submit their own work for assessment. Submitting the work or ideas of someone else without clearly acknowledging the source of borrowed material or ideas is plagiarism.

All assessments which you hand in must have a [Non Plagiarism Declaration Cover Sheet](#). This is for both individual and group work. Attach it to your assignment before submitting it to the Course Coordinator or at the School Office.

Plagiarism is the use of another person's work or ideas as if they were your own. When it is necessary or desirable to use other people's material you should adequately acknowledge whose words or ideas they are and where you found them (giving the complete reference details, including page number(s)). The Learning Centre provides further information on what constitutes Plagiarism at:

<https://student.unsw.edu.au/plagiarism>

## Academic Information

### COURSE EVALUATION AND DEVELOPMENT

Student feedback has helped to shape and develop this course, including feedback obtained from on-line evaluations as part of UNSW's myExperience process. You are highly encouraged to complete such an on-line evaluation toward the end of Term. Feedback and suggestions provided will be important in improving the course for future students.

### DATES TO NOTE

Refer to MyUNSW for Important Dates, available at:  
<https://my.unsw.edu.au/student/resources/KeyDates.html>

### ACADEMIC ADVICE

For information about:

- Notes on assessments and plagiarism,
- Special Considerations,
- School Student Ethics Officer, and
- BESS

refer to the School website available at  
<http://www.engineering.unsw.edu.au/biomedical-engineering/>

### Supplementary Examinations:

Supplementary Examinations for Term 3 2021 will be held on Monday 10th January – Friday 14th January (inclusive) should you be required to sit one.

### CRICOS

CRICOS Provider Code: 00098G

### Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.

## Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

Program Intended Learning Outcomes	
Knowledge and skill base	
PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline	✓
PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline	✓
PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline	✓
PE1.4 Discernment of knowledge development and research directions within the engineering discipline	✓
PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline	
PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline	✓
Engineering application ability	
PE2.1 Application of established engineering methods to complex engineering problem solving	
PE2.2 Fluent application of engineering techniques, tools and resources	✓
PE2.3 Application of systematic engineering synthesis and design processes	
PE2.4 Application of systematic approaches to the conduct and management of engineering projects	
Professional and personal attributes	
PE3.1 Ethical conduct and professional accountability	
PE3.2 Effective oral and written communication in professional and lay domains	✓
PE3.3 Creative, innovative and pro-active demeanour	
PE3.4 Professional use and management of information	
PE3.5 Orderly management of self, and professional conduct	
PE3.6 Effective team membership and team leadership	✓