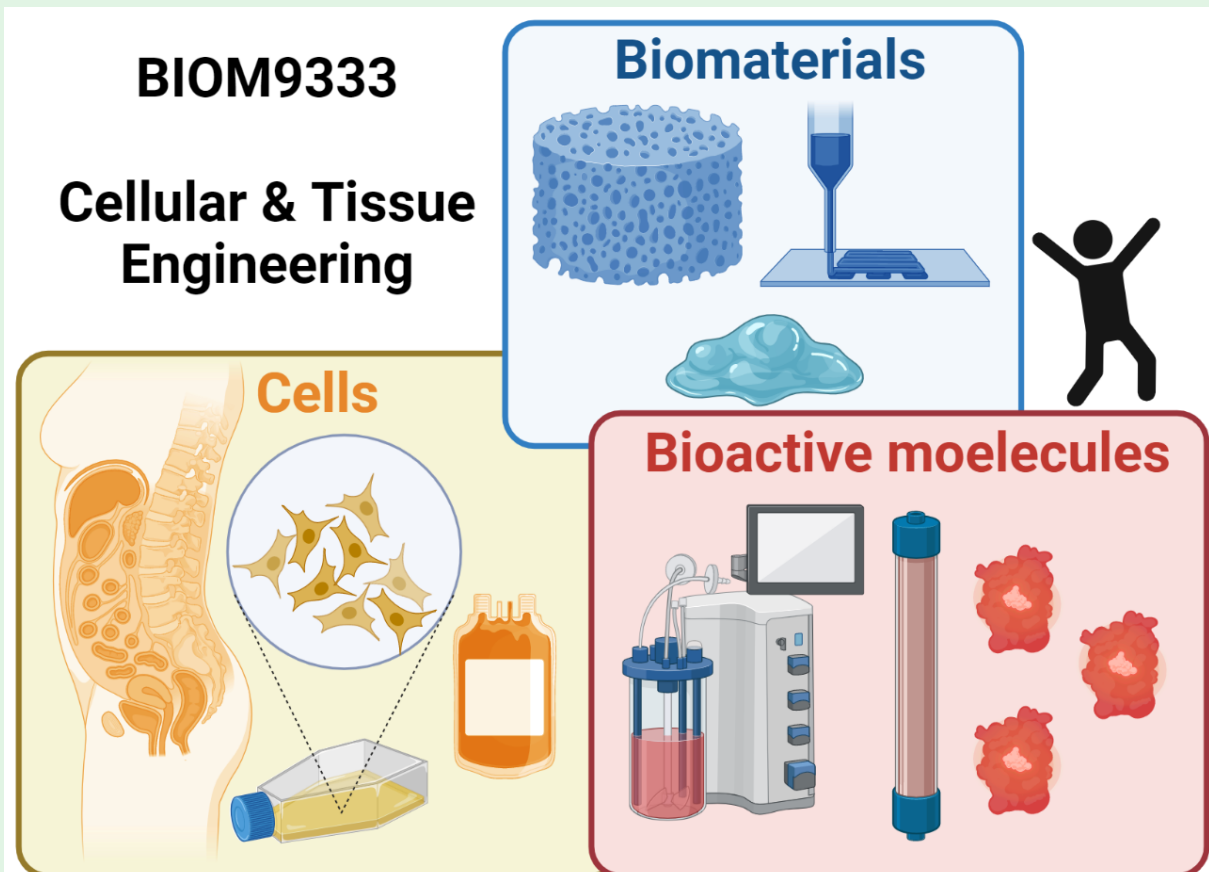


BIOM9333

Cellular and Tissue Engineering

Term 3, 2022



Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Megan Lord	m.lord@unsw.edu.au	by appointment	Room 505, Level 5 Samuels Building	+61293853 910

School Contact Information

Student Services can be contacted via 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 you 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 you to continuously recall information, challenge your 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 your 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.

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. Checkpoint Tasks	15%	refer to course schedule	1, 2
2. Tasks	30%	refer to course schedule	2, 3, 4
3. Quizzes	30%	refer to course schedule	1, 2, 3
4. Major Project 	20%	refer to course schedule	2, 3, 4
5. Peer review	5%	refer to course schedule	3

Assessment 1: Checkpoint Tasks

Due date: refer to course schedule

Checkpoint tasks (8) will ensure you are keeping up with content by answering a set of questions each week.

Assessment 2: Tasks

Due date: refer to course schedule

Individual tasks (3), 10% each, provide an opportunity to apply the theory obtained from the lessons.

Assessment 3: Quizzes

Due date: refer to course schedule

Mid-term quiz 10% and Final Exam 20%

These will consolidate learning in the lessons and activities in the form of multiple-choice questions and extended response questions.

Assessment 4: Major Project (Group)

Due date: refer to course schedule

The major project will see you design a regenerative medicine product utilising a bioactive. This will be assessed in multiple parts: Milestones (3, 1% each), Product pitch (5%), Technical report (8%) and Reflection (4%).

Assessment 5: Peer review

Due date: refer to course schedule

Peer review of the major project product pitches from other teams will develop your critical review skills and broaden understanding of the field of regenerative medicine.

Attendance Requirements

Students are encouraged to complete the relevant lesson prior to attending the workshop each week.

Course Schedule

[View class timetable](#)

Timetable

Date	Type	Content
Week 1: 12 September - 16 September	Topic	Principles of Tissue engineering and regenerative medicine (TERM) I
	Module	<ul style="list-style-type: none"> • Lesson 1 • Activity 1
	Workshop	<ul style="list-style-type: none"> • Course Introduction • Consolidate Lesson 1 • Activity 1 • Q&A
	Assessment	<ul style="list-style-type: none"> • Checkpoint 1 (individual task)
Week 2: 19 September - 23 September	Topic	Principles of TERM II
	Module	<ul style="list-style-type: none"> • Lesson 2 • Activity 2
	Workshop	<ul style="list-style-type: none"> • Consolidate Lesson 2 • Activity 2 • Biomaterials showcase • Q&A
	Assessment	<ul style="list-style-type: none"> • Checkpoint 2 (individual task)
Week 3: 26 September - 30 September	Topic	Principles of TERM III
	Module	<ul style="list-style-type: none"> • Lesson 3 • Activity 3
	Workshop	<ul style="list-style-type: none"> • Consolidate Lesson 3 • Activity 3 • Q&A • Major Project Session I
	Assessment	<ul style="list-style-type: none"> • Checkpoint 3 (individual task) • Tissue Engineering Task (individual task)

		<ul style="list-style-type: none"> • Major Project Milestone I (individual task) • Major Project Milestone II (team task)
Week 4: 3 October - 7 October	Topic	Recombinant protein expression I
	Module	<ul style="list-style-type: none"> • Lesson 4 • Activity 4
	Workshop	<ul style="list-style-type: none"> • Consolidate Lesson 4 • Activity 4 • Cells showcase • Major Project Session II • Q&A
	Assessment	<ul style="list-style-type: none"> • Checkpoint 4 (individual task)
Week 5: 10 October - 14 October	Topic	Recombinant protein expression II
	Module	<ul style="list-style-type: none"> • Lesson 5 • Activity 5
	Workshop	<ul style="list-style-type: none"> • Consolidate Lesson 5 • Activity 5 • Q&A • Major Project Session III
	Assessment	<ul style="list-style-type: none"> • Checkpoint 5 (individual task) • Mid-term Quiz (individual task) • Major Project Milestone III (team task)
Week 6: 17 October - 21 October		
Week 7: 24 October - 28 October	Topic	Production of bioactives I
	Workshop	<ul style="list-style-type: none"> • Consolidate Lesson 6 • Activity 6 • Q&A
	Module	<ul style="list-style-type: none"> • Lesson 6 • Activity 6
	Assessment	<ul style="list-style-type: none"> • Checkpoint 6 (individual task) • Recombinant protein task (individual task) • Major Project product pitch (team task)
Week 8: 31 October - 4 November	Topic	Production of bioactives II
	Module	<ul style="list-style-type: none"> • Lesson 7 • Activity 7
	Workshop	<ul style="list-style-type: none"> • Consolidate Lesson 7 • Activity 7 • Chromagraphy showcase • Q&A

		<ul style="list-style-type: none"> • Major Project Session IV
	Assessment	<ul style="list-style-type: none"> • Checkpoint 7 (individual task) • Major project peer review (individual task)
Week 9: 7 November - 11 November	Workshop	<ul style="list-style-type: none"> • Activity 8 • Q&A
	Assessment	<ul style="list-style-type: none"> • Checkpoint 8 (individual task) • Bioprocessing Task (individual task)
Week 10: 14 November - 18 November	Workshop	<ul style="list-style-type: none"> • Course Q&A
	Assessment	<ul style="list-style-type: none"> • Major Project Technical Report (team task) • Major Project Reflection (individual task)

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 UNSW's myExperience process.

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 in 2022 have included the inclusion of hands-on activities in some workshops and revision of the course content and assessments.

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](#).

Assignments should be submitted on time. A daily penalty of 5% of the marks available for that assignment will apply for work received after the due date. Any assignment more than 5 days late will not be accepted. The only exemption will be when prior permission for late submission has been granted by the Course coordinator. Extensions will be granted only on medical or compassionate grounds under extreme circumstances.

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 1 2022 will be held on (TBC) should you be required to sit one.

This course outline sets out description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle should be consulted for the up to date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline (as updated in Moodle), the description in the Course Outline/Moodle applies.

Image Credit

Biorender.com

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	✓