Session 1, 2017
BIOM9333 Cellular and Tissue Engineering

COURSE DETAILS

Units of Credit: 6
Contact hours: 3 hours per week
Lecture: Wednesday, 14:00 – 17:00, Vallentine Room (Vall) 121

Tutorial/Laboratory: Wednesday, 14:00 – 17:00, Biosciences Room (Biosci) 449, Samuels Room (Sam) 513 and 518, Vall121, Mathews Room 227 and 228.

Course Coordinators
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Lecturers
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Demonstrators: TBA

INFORMATION ABOUT THE COURSE

This course outlines the concepts of cell-based products for the pharmaceutical and medical industries from both a theoretical and practical perspective. A combination of lectures, tutorials, laboratory classes and a site visit are included in this course.

There is no assumed knowledge for this course. This course compliments other BIOM courses including Biocompatibility, Mechanical Properties of Biomaterials, Chemistry and Physics of Synthetic and Biological Polymers, Regulatory Requirements for Biomedical Technology, Clinical Laboratory Science and certain thesis topics.

HANDBOOK DESCRIPTION

This course outlines the concepts of cell-based products for the pharmaceutical and medical industries from both a theoretical and practical perspective. This course will cover the basis of how proteins are produced by cells; recombinant technologies to produce proteins and biologics from bacterial and mammalian systems; process design and optimisation needed for commercial production of biologicals; case studies of currently manufactured biological products; cell isolation including blood and progenitor cells; and translation of these technologies for tissue engineering and regenerative medicine.
OBJECTIVES

The objectives of this course align with program outcome attributes and assessment tasks as follows:

<table>
<thead>
<tr>
<th>Course objectives</th>
<th>Assessment task</th>
<th>Program outcome attributes</th>
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</thead>
<tbody>
<tr>
<td>Understand the underlying principles of developing and processing commercial quantities of biologics for the pharmaceutical and medical industries (including tissue engineered medical devices).</td>
<td>Quizzes Lab Report Major Project Final Exam</td>
<td>An in-depth engagement with the relevant disciplinary knowledge in its inter-disciplinary context. Capacity for analytical and critical thinking and for creative problem solving. Ability to engage independent and reflective learning. Information literacy. Skills for effective communication.</td>
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<tr>
<td>Problem solving skills in the medical field.</td>
<td>Quizzes Major project Final Exam</td>
<td>Capacity for analytical and critical thinking and for creative problem solving. Skills for effective communication.</td>
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<tr>
<td>Teamwork skills and an understanding of an individual’s strengths in a team environment.</td>
<td>Lab report Major Project</td>
<td>Skills for collaborative and multi-disciplinary work.</td>
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<tr>
<td>Communication skills in scientific presentation and writing.</td>
<td>Lab Report Major Project</td>
<td>Skills for effective communication.</td>
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</table>

TEACHING STRATEGIES

A combination of lectures, tutorials, laboratory classes and a site visit are used in this course to expose students to a range of teaching modes. These modes encompass a range of teaching styles, including passive and active participation.

For each hour of contact it is expected that you will put in at least 1.5 hours of private study.

Private Study

- Review lecture material
- Work through activities and do set assignments
- Reflect on class problems and assignments
- Download and work through materials from Moodle
- Keep up with notices and find out marks via Moodle

Lectures

- Find out what you must learn
- Follow worked examples
- Hear announcements on course changes

Activities (problem solving sessions, laboratory work, site visit, …)

- Hands-on work, to set studies in context
- Be guided by experts
- Practice solving set problems
- Ask questions

Assessments (quizzes, final examination, major assignment and laboratory report)

- Demonstrate your knowledge and skills
- Demonstrate higher understanding and problem solving
EXPECTED LEARNING OUTCOMES
By the end of this course students will have gained a theoretical and practical understanding of:

- how proteins are produced by cells;
- recombinant technologies to produce proteins and biologics from bacterial and mammalian and viral systems;
- process design and optimisation needed for commercial production of biologicals;
- case studies of currently manufactured biological products;
- cell isolation including blood and progenitor cells;
- translation of these technologies for tissue engineering and regenerative medicine.

These learning outcomes will be achieved through maximal participation in area of the structured teaching strategies provided in class time (lectures and activities) as well as student-centred and self-directed learning (private study and completion of assessment tasks)

ASSESSMENT
The assessment tasks for BIOM9333 Cellular and Tissue Engineering have been designed to measure your achievement of the learning outcomes.

The final grade for this course will normally be based on the sum of the scores from each of the assessment tasks. The Final Examination is worth 60% of the Final Mark if class work is included and 100% if class work is not included. The class work is worth 40% of the Final Mark if included. A mark of at least 40% in the final examination is required before the class work is included in the final mark. The formal exam scripts will not be returned. Students who perform poorly in the quizzes and tutorials are recommended to discuss progress with the Course Convenor during the semester. Note: The Course Convenor reserves the right to adjust the final scores by scaling if agreed by the Head of School.

Quizzes will consist of multiple choice and short answer questions and are designed to encourage learning throughout the semester and prepare students for the types of questions in the final exam. These quizzes will be held during the first 15 minutes of class in weeks 5 and 9.

Major Project is a biological process design project that will explore the processing of a biologic into a tissue engineered device. This task is designed to foster team work and put the theory into action. This project involves a written report and a group presentation.

A Laboratory Report for the DNA and protein laboratory class is designed to teach students how to consolidate learning in the practical activity.

The Final Exam will be a closed book exam with a combination of multiple choice and short answer questions. The final exam will be held during the formal exam period. Materials allowed: University approved calculator.

The marks assigned and dates of submission of each assessment task are set out below. Details of each assessment component, the marks assigned to it, the criteria by which marks will be assigned, and the dates of submission are provided in detail on Moodle.

ASSIGNMENTS

1. Quiz 1 (5%) of course assessment due on: 29 March 2017
2. Laboratory Report (10%) of course assessment due on: 5 April 2017
3. Quiz 2 (5%) of course assessment due on: 26 April 2017
4. Major Project (20%) of course assessment due on: 24 May 2017

Assignments must be submitted to the Course Convenor at the start of the scheduled class time on the nominated submission day. Each submitted assignment must contain 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.

Assessment marks will be available on Moodle as soon as they have been marked, which will usually be within 2 weeks of submission. Assessment documents will be available in the class following assessment mark release on Moodle and subsequently via the School Reception on Level 5 Samuels Building upon displaying your student ID card.
## COURSE PROGRAM

A table of lecture and activity class topics for each week, indicating the location and name of lecturer involved.

### SEMESTER 1, 2017

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Location</th>
<th>Assessment Due</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>1 March</td>
<td>Course Introduction Cells, Tissues, Proteins and Nucleic acids (FT)</td>
<td>Vall121</td>
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<td></td>
<td></td>
<td><strong>Activity:</strong> Transcription</td>
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<td>2</td>
<td>8 March</td>
<td>Recombinant protein production I (JRK)</td>
<td>Vall121</td>
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<td><strong>Activity:</strong> Vector design</td>
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<td>3</td>
<td>15 March</td>
<td>Recombinant protein production II (JRK)</td>
<td>Vall121</td>
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<td></td>
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<td><strong>Activity:</strong> Design of recombinant proteins</td>
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<td>4</td>
<td>22 March</td>
<td><strong>Activity:</strong> Cells, Tissues, Proteins and Nucleic acids</td>
<td>Biosci449/</td>
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<td>Sam513</td>
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<td>5</td>
<td>29 March</td>
<td>Process design - production of Bioactives I (ML)</td>
<td>Vall121</td>
<td>Quiz 1 (5%)</td>
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<td>6</td>
<td>5 April</td>
<td>Process design - production of Bioactives II (ML)</td>
<td>Vall121</td>
<td>Laboratory Report (10%)</td>
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<td><strong>Activity:</strong> Bioactive Process Design - Bioreactor modelling I</td>
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<td>7</td>
<td>12 April</td>
<td>Tissue Engineering: Cell-based therapies (ML)</td>
<td>Vall121/Vall121/Vall121/Sam518</td>
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<td></td>
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<td><strong>Activity:</strong> Bioactive Process Design – Downstream processing</td>
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<td></td>
<td>Break</td>
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<td>8</td>
<td>26 April</td>
<td>Tissue Engineering: Bone and Cartilage (ML)</td>
<td>Vall121</td>
<td>Quiz 2 (5%)</td>
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<td></td>
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<td><strong>Activity:</strong> Group project activity on production of bioactive for major report</td>
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<td>9</td>
<td>3 May</td>
<td>Tissue Engineering: Blood vessels (ML)</td>
<td>Vall121</td>
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<td><strong>Activity:</strong> Group presentations</td>
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<td>10</td>
<td>10 May</td>
<td>Tissue Engineering: Soft tissues (BF)</td>
<td>Vall121</td>
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<td><strong>Activity:</strong> Skin tissue engineering</td>
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<td>11</td>
<td>17 May</td>
<td><strong>Site visit:</strong> Australian Red Cross Blood Service</td>
<td>Alexandria</td>
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<td>12</td>
<td>24 May</td>
<td><strong>Activity:</strong> Tissue engineering and regenerative medicine</td>
<td>Mathews 227/228</td>
<td>Major Report (20%)</td>
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<td>13</td>
<td>31 May</td>
<td>No class</td>
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### RELEVANT RESOURCES

- Bioprocess Engineering – Basic Concepts (2nd edition)
- Additional materials provided on Moodle.
- Recommended Internet sites.

### COURSE EVALUATION AND DEVELOPMENT

Student feedback has helped to shape and develop this course, including feedback obtained from online evaluations as part of UNSW’s myExperience process. Changes to the course have included revision to the course content and incorporation of additional practical activities. Last year 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’.

### DATES TO NOTE

Refer to MyUNSW for Important Dates, available at: [https://my.unsw.edu.au/student/resources/KeyDates.html](https://my.unsw.edu.au/student/resources/KeyDates.html)
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 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/