COURSE DETAILS

Units of credit: 6
Contact hours: 3 hours per week

Lecture: Thursdays 9 - 10 am
  Electrical Engineering Room G22 (weeks 1-4)
  Mathews Theatre A (weeks 5, 7-10)

Activity: Thursdays 10 am – 12 pm
  Quadrangle Building Rooms G034 and 1043

Course coordinator: Associate Professor Megan Lord
  email: m.lord@unsw.edu.au
  office: Room 505, Samuels Building

Guest lecturer: Dr Zehra Elgundi
  Activity leader: Email: z.elgundi@unsw.edu.au
  Office: LG, Samuels Building

COURSE AIM

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 medical devices.

COURSE DESCRIPTION

This course outlines the concepts of cell-based products for the pharmaceutical and medical device industries from both a theoretical and practical perspective. This course will cover the basis of how biologics (e.g., 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, including biomaterials, cells and growth factors, and the clinical application of these principles in various tissues.

There is no assumed knowledge for this course. This course complements 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.

LEARNING OUTCOMES

On completion of the course, the successful student will be able to:

LO-1 Describe the principles of cellular and tissue engineering.
LO-2 Apply the principles of cellular and tissue engineering to theoretically develop processes for the production of biologics and tissue engineered medical devices.
LO-3 Synthesise, compare and evaluate scientific literature to inform design of biologics and tissue engineered medical devices.
LO-4 Communicate effectively in a professional environment through technical reports and presentations.
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** includes reviewing lecture material, completing online/in class activities and assessments.
- **Lectures** includes include listening to course content presentations, follow worked examples and receive course updates.
- **Activities** include hands-on work to set course content in context and guided by experts and ask questions.
- **Assessments** demonstrate your knowledge and skills

ASSESSMENT

The assessments 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 term. Note: The Course Convenor reserves the right to adjust the final scores by scaling if agreed by the Head of School.

- **Quizzes (2 in total worth 9% of the course assessment).** 15-minute timed quizzes as the start of the tutorial submitted via moodle under exam conditions to assess mastery of LO-1. Schedule: Quiz 1 (4.5%), Quiz 2 (4.5%).

- **Tutorial tasks (4 in total worth 11% of the course assessment).** Short responses submitted via moodle to consolidate learning in the tutorials (in class and online) to assess mastery of LO-1 to LO-3 including:
  A. Observation of different cell types used for recombinant protein expression (2%)
  B. Derive mammalian cell growth parameters from in class data (3%)
  C. Report on preferred antibody for commercial production based on completing the tutorial activity (3%)
  D. Report on observation of mammalian tissues (3%)

- **Major project report and presentation (report 15% and presentation 5%, worth 20% of the course assessment).** Group project on biologics process design and incorporation into tissue engineered device will assess mastery of LO-2 to LO-4.

- **Final exam (60% of the course assessment).** 2h exam in formal exam period to assess mastery of LO-1 and LO-2.

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.
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<td>Tissues, cells and protein synthesis.</td>
<td>Transcription, translation and protein synthesis Design-a-cell</td>
<td>Videos to watch about DNA, transcription and translation</td>
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<td>2</td>
<td>Process design for the production of bioactives: (A) Bioreactors, (B) Cell growth</td>
<td>Measure mammalian cell growth Bioreactor modelling</td>
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<td>3</td>
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<td>Vector Design</td>
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<td>Process design for the production of bioactives: (C) Downstream processing and (D) Quality control</td>
<td>Observation of cells used for recombinant protein expression Design of recombinant proteins for tissue engineering.</td>
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<td>5</td>
<td>Principles of tissue engineering and regenerative medicine: (A) clinical successes and (B) cell therapies</td>
<td>Antibody production and downstream processing</td>
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<td>Visit to the Australian Red Cross Blood Service (Alexandria).</td>
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<td>Videos to watch about tissue engineering at UNSW</td>
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RELEVANT RESOURCES

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

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. Changes to the course have included revision to the course content and incorporation of additional practical activities. 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’.

DATES TO NOTE

Important Dates available at: https://student.unsw.edu.au/dates

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.

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

Refer to the school website http://www.engineering.unsw.edu.au/biomedical-engineering/ for information about:

- Notes on assessments and plagiarism,
- Special Considerations,
- School Student Ethics Officer, and
- Biomedical Engineering Student Society