BMEN90011 Tissue Engineering & Stem Cells

Credit Points:	12.5
Level:	9 (Graduate/Postgraduate)
Dates & Locations:	2016, Parkville This subject commences in the following study period/s: Semester 2, Parkville - Taught on campus.
Time Commitment:	Contact Hours: 1 x 2 hour lecture + 1 x 1 hour lecture + 1 x 1 hour tutorial per week + 2 x 3 hours laboratory work per semester. Total Time Commitment: Estimated 200 hours
Prerequisites:	
Corequisites:	None
Recommended Background Knowledge:	It is recommended that students have completed ANY ONE of: CHEN90008 Biology for Engineers (Prior to 2013)

Subject	Study Period Commencement:	Credit Points:
CHEN90031 Bioprocess Engineering	Semester 1	12.50

(Prior to 2014 CHEN30014 Bioprocess Engineering or BTCH90006 Bioprocess Engineering)

Subject	Study Period Commencement:	Credit Points:
BIOL10002 Biomolecules and Cells	Semester 1	12.50
BIOL10004 Biology of Cells and Organisms	Semester 1	12.50

AND ONE OF:

Subject	Study Period Commencement:	Credit Points:
CHEM10006 Chemistry for Biomedicine	Semester 1	12.50
CHEM10003 Chemistry 1	Semester 1, Semester 2	12.50

AND:

Subject	Study Period Commencement:	Credit Points:
MAST10006 Calculus 2	Semester 1, Semester 2	12.50

Non Allowed Subjects:	411-394 / 411-651 Tissue Engineering 411-650 Tissue Engineering & Bionanotechnology 600-652 Tissue Engineering & Stem Cells BTCH90008 Tissue Engineering and Stem Cells
Core Participation Requirements:	For the purposes of considering request for Reasonable Adjustments under the Disability Standards for Education (Cwth 2005), and Students Experiencing Academic Disadvantage Policy, academic requirements for this subject are articulated in the Subject Description, Subject Objectives, Generic Skills and Assessment Requirements of this entry.The University is dedicated to provide support to those with special requirements. Further details on the disability support scheme can be found at the Disability Liaison Unit website: http://www.services.unimelb.edu.au/disability/

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Subject Overview:	**AIMS** Students studying Tissue Engineering and Stem Cells will become familiar with the history, scope and potential of tissue engineering, and the potential role of stem cells in this field. This subject will address the use of biomaterials in tissue engineering; major scaffold materials and fabrication methods, scaffold strength and degradation; cell sources, selection, challenges and potential manipulation; cell-surface interactions, biocompatibility and the foreign body reaction; the role and delivery of growth factors for tissue engineering applications; in vitro and in vivo tissue engineering strategies, challenges, cell culture, scale-up issues and transport modelling; ethical and regulatory issues; clinical applications of tissue engineering, such as bone regeneration, breast reconstruction, cardiac and corneal tissue engineering, and organogenesis (e.g. pancreas). This subject provides students with exposure to and understanding of a range of new and emerging applications of biomedical engineering. It includes research-led learning with opportunities to interact with experts and active researchers in the fields of stem cells and tissue engineering. The subject covers aspects of biology, materials engineering and process engineering which underpin tissue engineering and provides examples of the applications of this evolving area of technology. **INDICATIVE CONTENT** Topics covered include tissue organization & tissue dynamics, stem cells, cellular fate processes & signalling, the ECM as scaffold material, natural and synthetic polymers for tissue engineering, bioceramics, scaffold design and fabrication, tailoring biomaterials, cell culture and cell nutrition, bioreactors for tissue engineering, risk management in tissue engineering, ethics in tissue engineering.
Learning Outcomes:	**INTENDED LEARNING OUTCOMES (ILO)** On completion of this subject the student is expected to: 1 Explain the significance, current status and future potential of tissue engineering 2 Identify key challenges in tissue engineering of different human tissues 3 Describe the design, fabrication and biomaterials selection criteria for tissue engineering scaffolds 4 Describe the sources, selection, potential manipulations and challenges of using stem cells for tissue engineering 5 Use simple models to quantify aspects of bioreactor design 6 Discuss the challenges of in vivo implantation of biomaterials and scale-up issues relating to human clinical applications and explain the ethical and regulatory issues of significance in tissue engineering.
Assessment:	One written assignment of approximately 3000 words (20%). Requiring a time commitment of approximately 25 to 30 hours of work. Intended Learning Outcomes (ILOs) 1, 2 and 6 are addressed in the assignment. Assessed weeks 6-9 Attendance and participation in two laboratory classes with a written assignment of approximately 2000 words (10%), requiring 13 to 15 hours of work including preparation. ILOs 3 and 5 are addressed in these laboratory classes. Assessed weeks 6-11 One written 3-hour closed book end-of-semester examination (70%). ILOs 1 to 6 are addressed in the exam. Held in the end-of-semester exam period.
Prescribed Texts:	None
Recommended Texts:	None
Breadth Options:	This subject is not available as a breadth subject.
Fees Information:	Subject EFTSL, Level, Discipline & Census Date, http://enrolment.unimelb.edu.au/fees

Generic Skills:	# Apply knowledge of basic science and engineering fundamentals # Undertake problem identification, formulation and solution # Utilise a systems approach to design and operational performance # Function effectively as an individual and in multidisciplinary and multicultural teams, with the capacity to be a leader or manager as well as an effective team member.
Notes:	**LEARNING AND TEACHING METHODS** The subject will be delivered through a combination of lectures and tutorials. Students will also complete two laboratory practical sessions which will reinforce the material covered in lectures. **INDICATIVE KEY LEARNING RESOURCES** Students will have access to lecture notes and tutorial problem sheets with solution guides for the tutorial calculations provided after the tutorials. The assignments will involve a literature review along with peer reviewing and feedback. **CAREERS / INDUSTRY LINKS** Guest lectures will be given by experts in the field from industry and/or research institutions.
Related Course(s):	Doctor of Philosophy - Engineering Master of Biotechnology Master of Philosophy - Engineering
Related Majors/Minors/ Specialisations:	B-ENG Chemical Engineering stream B-ENG Chemical and Biomolecular Engineering stream Master of Engineering (Biochemical) Master of Engineering (Biomedical with Business) Master of Engineering (Biomedical) Master of Engineering (Chemical)