

Module Code	ME7B16
Module Name	Laboratory Techniques in Cell and Tissue Engineering
ECTS Weighting	5 ECTS
Semester taught	Semester 1
Module Coordinator/s	Prof. Mark Ahearne
Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline	<p>On successful completion of this module, students should have developed:</p> <p>LO1. An understanding of biosafety aspects in cell tissue culture</p> <p>LO2. An understanding of animal/human cell culture processes</p> <p>LO3. An ability to apply their acquired laboratory skills and experimental design skills to cell and tissue engineering experiments</p> <p>LO4. An ability to identify the engineering and biological issues relevant to cell and tissue engineering</p> <p>LO5. An understanding of the critical issues and choices needed in developing a tissue engineered construct</p> <p>LO6. Knowledge and understanding of the principles and use of state-of-the-art techniques of cell and tissue engineering through comparison of what is physically performed in the laboratory with what is presented in the corresponding lecture component</p> <p>LO7. Experience in data generation, analysis (including statistical analysis) and data presentation</p> <p>Graduate Attributes: levels of attainment</p> <p>To act responsibly - Enhanced</p> <p>To think independently - Enhanced</p> <p>To develop continuously - Enhanced</p> <p>To communicate effectively - Enhanced</p>

Module Content

This module is meant to serve as an introduction to cell culture and tissue engineering both for students who have little or no experience of cell culture and for scientists who do have some experience with sterile technique and mammalian cell culture and wish to advance their skill-set in the art of tissue engineering. The primary aim of this module is to familiarise students with the fundamentals and basics of cell and tissue culture and analysis of engineered cells and tissues. This module will consist of lectures on a number of key topics with an active learning laboratory approach. Students will be introduced to a multitude of techniques and topics that are essential to the “tissue engineer” including lab biosafety, cell isolation from various tissues, cell culturing and characterisation, hydrogel encapsulation and scaffold seeding, biochemical assays (cell viability, DNA, sGAG, collagen) and histological techniques. The principles of cell and tissue engineering will be presented through hands on laboratory experience.

Topics covered include *inter alia*:

- Health & safety aspects of tissue engineering and cell culture
- Isolation and culture of primary cells
- Preparation of culture media
- Cryopreservation of cells
- Preparation of scaffolds and hydrogels
- Live/Dead staining for the assessment of cell viability
- Colony-forming unit fibroblast (CFU-F) assay
- Histology and microscopy
- Biochemical analysis of tissue engineered constructs
- Mechanical characterization of scaffolds
- Molecular biology techniques for tissue engineers
- Data analysis and presentation

Teaching and Learning Methods

The module is taught using a combination of lectures and associated demonstration laboratories.

Assessment Details Please include the following: <ul style="list-style-type: none"> • Assessment Component • Assessment description • Learning Outcome(s) addressed • % of total • Assessment due date 	Assessment Component	Assessment Description	LO Addressed	% of total	Week due
	Laboratory attendance and participation	Each week the Teaching Assistants will grade your performance and participation at the laboratory session	1-3	30	Assessed Weekly
	Written Examination	Timetabled semester 1 examination	1-7	70	End of Semester 1
COVID-19 contingency plan	If necessary, laboratory access may be limited, therefore the number of laboratory sessions and time in the lab would need to be reduced. More online content including video demonstrations would be provided in addition to short quizzes to assess student learning.				
Contact Hours and Indicative Student Workload Error! Bookmark not defined.	Contact hours: 2 hours of lectures per week, 2 hours of laboratory demonstration per week				
	Independent Study (preparation for course and review of materials): 40 hours				
	Independent Study (preparation for assessment, incl. completion of assessment): 40 hours				
Recommended Reading List	<ul style="list-style-type: none"> • Culture of Cells for Tissue Engineering, Gordana Vunjak-Novakovic, R. Ian Freshney, 2006, (John Wiley & Sons, Inc.) • A Laboratory Course in Tissue Engineering, Melissa Kurtis Micou; Dawn Kilkenny, 2012, (CRC Press) 				
Module Pre-requisite	Not applicable				
Module Co-requisite	Not applicable				
Module Website					
Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.	No				

Module Approval Date

Approved by

Academic Start Year

Academic Year of Date