ME7B16 LABORATORY TECHNIQUES IN CELL AND TISSUE ENGINEERING
[5 Credits]

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Semester: 1

Module Organisation
This module runs during semester 1 and comprises of lectures and corresponding laboratory demonstrations and hands-on experience.

Module Description
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, primary and mesenchymal stem 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.

Learning Outcomes
On successful completion of this module, students should have developed:
1. An understanding of biosafety aspects in cell tissue culture
2. An understanding of animal/human cell culture processes
3. An ability to apply their acquired laboratory skills and experimental design skills to cell and tissue engineering experiments
4. An ability to identify the engineering and biological issues relevant to cell and tissue engineering
5. An understanding of the critical issues and choices needed in developing a tissue engineered construct
6. 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
7. Experience in data generation, analysis (including statistical analysis) and data presentation
Module Content
- Health & safety aspects of tissue engineering and cell culture
- Harvesting and Isolation of Primary cells
- Isolation and culture of Mesenchymal Stem Cells
- Preparation of Culture Media & Supplements
- Cell Freezing/Thawing
- Scaffold seeding and Preparation of Cell Loaded Hydrogels
- Live/Dead Staining for the Assessment of Cell Viability
- Colony-Forming Unit Fibroblast (CFU-F) Assay
- Mechanical Testing of Hydrogel Constructs
- Histological techniques and Microscopy
- Biochemical analysis of tissue engineered constructs
- Data analysis and presentation

Module Notes
Module notes, peer-reviewed journals and laboratory protocols will be used for this course and made available to students

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

Assessment Modes
- Health & Safety Project Assessment (5% of final grade)
- Open Book Examination (January) (60% of final grade)
- Technique demonstration/assignment (35% of final grade)

Recommended Texts