

AMERICAN UNIVERSITY OF BEIRUT
FACULTY OF ENGINEERING AND ARCHITECTURE

Tissue Engineering
CHEN 675 / BMEN 603
Fall 2020-2021

1. Course Administration

Instructor: Prof. Rami Mhanna

Office: 404 – RGB Bldg.

Phone: x 3635 (calls during office hours only)

Office hours: M 17:00-18:00 pm or by appointment

Email: rm136@aub.edu.lb

2. Course Description [3 credits]

In a world of aging population, an ever increasing demand for improvement of healthcare services and need for replacement organs and tissues is arising. The limited pool of donors together with the problem of donor organ rejection is a strong driver for engineering tissues and other body parts. Tissue engineering is an interdisciplinary field that uses cells, biomaterials, biochemical (e.g. growth factors) and physical (e.g. mechanical stimulation) signals, as well as their combination to generate tissue-like structures. The goal of tissue engineering is to provide biological substitutes that can maintain, restore or improve the function of damaged organs in the body. This course will introduce interested students to the new field of tissue engineering and provide insight on cutting edge applications in this area.

3. Time and Place

MW 14:00 – 15:15 [Duration: Sept 7 – December 19]

BCTL room 202

4. Prerequisites

By topic: Basic biology background

The course is open to engineering students (senior undergraduates and graduates).

5. References

- Material will be selected from book chapters, review articles and research journals
- **Tissue Engineering**, van Blitterswijk et al., Academic Press, 1st edition, 2008.

6. Course Objectives

By the end of this course, the student should be able to:

- Define tissue engineering and list examples of its applications
- List the different types of stem cells and identify their pros and cons
- State the main components of the cell matrix
- Categorize biomaterials into their different types
- Analyze literature related to tissue engineering
- Propose a solution for a certain tissue engineering problem

7. Course Topics [equivalent of around 1 week per topic]

- I. Introduction to tissue engineering
- II. Cells in tissue engineering: Future therapeutic prospects of adult stem cells
- III. Tissue Morphogenesis
- IV. Tissue Homeostasis
- V. The cell matrix and cellular signaling
- VI. Biomaterials for tissue regeneration
- VII. Scaffold design and Bioreactors
- VIII. Cartilage regeneration and joints
- IX. Bone regeneration and the skeleton
- X. Drug delivery
- XI. Biocompatibility
- XII. Future of regenerative medicine

8. Student Assessment

Major Assignment	30%
Quizzes/Minor Assignments	10-20%
Research presentation	30%
Final exam	30%

9. Moodle

Students are expected to check for updates on Moodle on a daily basis. Announcements, course handouts, and assignments will be available in “pdf” and/or video over power point format from Moodle.

10. Academic Barriers

AUB strives to make learning experiences as accessible as possible. If you anticipate or experience academic barriers due to a disability (including mental health, chronic or temporary medical conditions), please inform me immediately so that we can privately discuss options. In order to help establish reasonable accommodations and facilitate a smooth accommodations process, you are encouraged to contact the Accessible Education Office: accessibility@aub.edu.lb; [+961-1-350000](tel:+961-1-350000), x3246; West Hall, 314.