# AMERICAN UNIVERSITY OF BEIRUT
# FACULTY OF ENGINEERING AND ARCHITECTURE

# Biomaterials and Medical Devices
# BMEN 608 / MECH 634
# Fall 2019-2020

---

## 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 or by appointment
Email: rm136@aub.edu.lb

## 2. Course Description [3 credits]

The need for biomaterials is constantly increasing. This is the result of the enormous advances that have been created in the science and engineering of both surgical and medical technologies. This course covers the fundamentals of the properties and biocompatibility of metallic, ceramic, polymeric, and biological materials that are utilized in devices and biotechnology. New trends in biomaterials such as prosthetics, and new families of polymers, biopolymers, and composites with specific clinical properties will be discussed. A set of medical devices used in everyday clinical life will also be examined.

## 3. Time and Place

MW 15:30 – 16:45 [Duration: September 2 – December 19]
Munib & Angela Masri Complex 207

## 4. References

- Material will be selected form book chapters, review articles and research journals
- Biomaterials Science: An Introduction to Materials in Medicine, Edited by Buddy D. Ratner et al., Academic Press (ISBN 0-12-582461-0).

## 5. Educational Objectives

1- Gain a general overview of the human anatomy and physiology
2- Provide an overview of the nature and characteristics of materials used in biomedical applications
3- Develop an understanding of the concept of materials interaction with tissues
4- Develop an understanding of materials performance in the body
5- Present methodologies used to characterize biomaterials
6- Familiarize students with recent advances in biomaterials and novel approaches in their development.
7- Develop communication skills through written and oral presentation of a topic of interest related to the course subject

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

I. Introduction, Human Anatomy and Physiology, Biomaterials Overview
II. Different Types of Biomaterials: Metals, Polymers and Ceramics
III. Biomaterials-Tissue Interaction
IV. Biomaterials-Tissue Interaction-Continued
V. Tests for Mechanical and Biochemical Properties of Biomaterials
VI. Degradation of Materials in the Biological Environment
VII. Wound Healing and Skin Regeneration
VIII. Biomaterials for Blood Vessels and Heart Valves
IX. Biomaterials for Bone and Cartilage
X. Biomaterials for the Liver, Kidney, Brain etc
XI. Medical Implants and Devices
XII. Medical Implants and Devices-Continued
XIII. A look into the future of Biomaterials

## 7. Learning Outcomes:

By the end of the course, students should be able to:
1- Provide a general description of the human body in terms of anatomy and function
2- List the general classes of biomaterials
3- Explain the interdisciplinary nature of biomaterials development
4- Explain what happens to biomaterials when they get in contact with tissues
5- Analyze literature related to biomaterials research
6- Hypothetically design a biomaterial or medical device that suits a certain tissue

## 8. Student Assessment

| | |
|---|---|
| **Assignments** | **30%** |
| **Quizzes** | **30%** |
| **Research presentation** | **10%** |
| **Final exam** | **30%** |

There will be an optional additional assignment worth 10%, this grade can be used to replace your lowest two quizzes.

## 9. Resources

**Students are expected to check for updates on Moodle on a daily basis**. Announcements, course handouts, and assignments will be available 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, x3246; West Hall, 314.