King Saud University
College of Applied Medical Sciences
Department of Biomedical Technology
BMT337-Biomaterials 2 (2-0-0)

Current Instructor: Prof. H.S. Ranu, Fellow ASME
Course Coordinator: Prof. H.S. Ranu
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Textbook(s) and/or Other Required Materials:
Primary: Biomaterials by Prof. H.S. Ranu

Course Description (catalog): This course continues the coverage of a Review of some fundamental concepts in biomaterials

Prerequisites: BMT 228
Co-requisite: None
Course Type: Mandatory

Course Learning Outcomes: Upon completing BMT337, students should be able to:

- Understand mechanical properties of different biological materials as well as natural and synthetic materials & ability to recommend replacement material for a given application in human body.
- define, state, compare, similarities & differences of different materials)
- know how use biomaterials in general to substitute the human body tissues.
- demonstrate using graphical representation of the stress vs strain and Young's Modulus of different biomaterials
- use other biomaterials e.g., biopolymers, bio-ceramics, bio-glass

Student Outcomes Covered by Course:
a. an ability to select and apply the knowledge, techniques, skills, and modern tools of biomedical technology to include the application of circuit analysis, analog and digital electronics, microcomputers, biomechanics, biomedical instrumentation systems, and safety in the building, testing, operation, and maintenance of biomedical equipment.
Understanding the fundamental concepts in biomaterials e.g., stress, strain, Young's Modulus related to different biomaterials as well as biological tissues and their respective relation to mechanical forces
b. an ability to select and apply a knowledge of mathematics, chemistry, physics, and biological sciences, engineering, and technology to building, testing, operation, and maintenance of biomedical equipment and the ability to utilize statistics/probability, transform methods, discrete mathematics, or applied differential equations in support of biomedical systems.
Understand the mechanical test conducted to obtain load-deformation and stress-strain curves and properties deduced from the test and its correlation with yielding and fracture initiation depending on material classification
c. an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes.

d. an ability to analyze, design, and implement biomedical systems, components or processes for broadly-defined engineering technology problems appropriate to program educational objectives.
e. an ability to function effectively as a member or leader on a technical team.
Develop personal and social responsibility while working in a team through the preparation of a project report on a selected biomaterials topic.
f. an ability to identify, analyze, and solve broadly-defined biomedical technology problems.
g. an ability to apply written, oral, and graphical communication in both technical and nontechnical environments; and an ability to identify and use appropriate technical literature.
Student will improve their written, oral and communication skills in general by making a deep literature search to cover a selected topic in biomaterials. In addition to a well structured report, students will have to make a concise presentation on the matter and lead a short discussion session.
h. an understanding of the need for and an ability to engage in self-directed continuing professional development.
i. an understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity.
j. a knowledge of the impact of engineering technology solutions in a societal and global context and an understanding of the clinical application of biomedical equipment.
k. a commitment to quality, timeliness, and continuous improvement.

Major Topics covered and schedule in weeks:

1. Review of some fundamental concepts in biomaterials
2. Plates for fixing fractures
3. Vascular Prosthesis: Dacron (Knitted), Hydrogels, Breast Implants (Silicone)
4. Characteristic of different materials (Table for cortical bone, PMMA, UHMWPE, CoCr, Ti, TIAIV, etc
5. Wear Characteristic of different materials
6. Use of Finite Element Modelling in Biomaterials e.g. interface between bone and implant and other materials analysis
7. Biocompatibility, How to use biocompatibility, compatibility in selection of different biomaterials
8. Properties and uses of different biomaterials, Bio-ceramics, Normal and artificial ligaments and tendons- physical properties and their development.
9. Bioploymers, use of bio-ploymers as a biomaterial, Bio-ceramics and Bioglass materials, Use of Carbon fibres as a biomaterial
10. Properties of Normal and Artificial Ligaments