

## BME 672

### Biomaterials

**Prerequisite:** Mech 232 (see undergraduate catalog for description) or equivalent

**Course Summary:** This course will examine the use of solid materials for biomedical applications. It will explore the origin and utility of condensed phase behavior including crystallization, amorphous material formation and the influence of morphology on physical behavior. Metals, ceramics and polymers will be examined as three major categories of biomaterials. Molecular geometry will be discussed in terms of its impact on the structure and function of proteins and other biomolecules. The molecular and cellular dynamics at the surface of an implanted device will be articulated to clarify the response of the body to implanted material. FDA regulation and ethical issues related to medical device development will be discussed.

**Course Learning Outcomes:** On completion of this course the student should be able describe the properties of the major types of materials used in medical device fabrication and understand how these properties are implemented in various types of medical devices. The student should also be able to understand and discuss the factors that impact the retention of function of an implanted device, as well as the factors that impact how the implanted device influences the surrounding tissue. The student should be able to comprehend current biomaterials research and use that as a basis for developing new solutions to biomaterials problems.

#### Course Schedule:

Week 1	Holiday
Week 2	Solid Materials
Week 3	Properties of Solid Materials
Week 4	Chemical and Cellular Fundamentals
Week 5	Biomaterial Paradigm / Quiz
Week 6	Metals for Implants
Week 7	Ceramic Biomaterials / Student Lectures
Week 8	Polymer Materials / Student Lectures
Week 9	Polymeric Biomaterials / Quiz
Week 10	Student Lectures
Week 11	Proposing New Ideas / Student Lectures
Week 12	Natural Biomaterials / Student Lectures
Week 13	Ethics and Regulatory / Quiz
Week 14	Proposal Forum
Week 15	Final

**Textbooks:**

Biomedical Materials

Roger Narayan, editor

Hardcover: ISBN 978-0-387-84871-6

Materials Science and Engineering: An Introduction, 8<sup>th</sup> Edition

William D. Callister, David G. Rethwisch

Hardcover: ISBN 978-0-470-41997-7

**Grading Schema: (weighting factors)**

In class participation	.10
In class quizzes	.35
Homework	.25
Final exam	.30

**Academic Integrity Policy:** NJIT Honor Code