

INSTRUCTOR: M. Christie Classroom: EC 1113 TIME: MW 2:00pm – 3:15pm

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Office Hours: MW 11:00 am-12:00 am or by appointment

TA OFFICE HOURS: Wed 3pm – 4:30pm

TEXT: Biomaterials :An Introduction, 3rd Ed.
Joon Parks & R. S. Lakes. Springer, NY, 2007

COURSE OBJECTIVES:

This purpose of this course is to provide the scientific foundation for the use of engineered materials in the human body for the purposes of aiding healing, correcting deformities, and restoring lost function. The major goal of the course is to develop in the student a familiarity with the uses of materials in medicine and a rational basis for these applications.

At the conclusion of this course, the student should be able to:

1. Apply basic engineering techniques and principles to predict and interpret the structure of solids, gels, etc`.
2. Demonstrate clear understanding of process-property relationships in engineered materials
3. Demonstrate proficiency in the basic principles of some selected materials evaluation and analytical techniques.
4. Demonstrate proficiency in the understanding of characterization and modeling of the structure-property relationships of biological materials and the principles of biocompatibility.
5. Determine materials choices taking into account the structure-property relationships of the material (metal, ceramic, polymer, composite), as well as the medical application (soft or hard tissue replacement/augmentation).
6. Prepare and present a conceptual design which demonstrates all of the course objectives through a group project which will be approved by the instructor.

COURSE DESCRIPTION:

The contents of the course include biocompatibility, techniques to minimize corrosion or other degradation of implant materials, principles of materials science as it relates to the use of materials in the body, and specific uses of materials in various tissues and organs. Topics covered include properties of metals, polymers, ceramics, composites, biomaterials processing, evaluation, and biocompatibility. Topics to be introduced include strengthening techniques and special effects in selected materials, including, superplasticity, superelasticity, piezoelectricity, pyroelectricity, nanoscale materials and processing and bioengineered materials.

POINTS DISTRIBUTION: Homework/ Quiz Exam I Exam II Exam II Group Project
5% 20% 20% 40% 15%

 COURSE OUTLINE

# SESSIONS	CHAPTER	TOPIC
1		Introduction and Overview of Biomaterials
1		Bonding and Microstructure of the Solid State
2		Structure and Properties of Metals
2		“ “ “ Polymers
2		“ “ “ Ceramics
2		Composites and Special effects in solids
1		Characterization of Materials
1		Degradation
1		EXAM I
2		Structure-Property Relationships of Biological Materials
3		Biocompatibility
2		Metallic Implant Materials
2		Ceramic Implant Materials
2		Polymeric and Composite Implant Materials
1		Gels and smart material implants
1		EXAM II
2		Soft Tissue Replacement
2		Hard Tissue Replacement
<u>1</u>		Project Presentations
1		FINAL EXAM
32 total		