BMED/MSE 4751 Introduction to Biomaterials (Elective)

Catalog Description: BMED 4751 Intro to Biomaterials (3-0-3)
Prerequisite(s): MSE 2001
Introduction to different classes of biomaterials (polymers, metals, ceramics) and physiological responses to biomaterial implantation. Topics include material properties, host response, and biomaterial characterization techniques.

Textbook: Biomaterials: The Intersection of Biology and Materials Science, Temenoff and Mikos, Pearson Prentice-Hall (2008)

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Topics Covered:

1. Materials science of biomaterials
    a. Classes of materials for biomedical applications
    b. Chemical composition, structure, physical and mechanical properties of biomaterials
    c. Processing and degradation of polymer-based biomaterials
    d. Surface properties of biomaterials
2. Biological implications of biomaterials
    a. Protein and cell interactions with biomaterials
    b. Effects of biomaterials on thrombosis, acute inflammation, wound healing, and immune responses of host
    c. Infection due to biomaterials

Course outcomes:

Students who complete this course will:
Outcome 1: Understand the structure-properties relationships in ceramic, metal, and polymer biomaterials (Student Outcomes e and k)
Outcome 2: Understand the biological environment and mechanisms within the host that interacts with implanted biomaterials and ultimately determine their function in vivo (Student Outcomes a and k)
Outcome 3: Understand the basic principles and applications of characterization techniques for surface and bulk properties of materials, as well as biological responses to materials (Student Outcomes b and k)
Outcome 4: Understand basic biomedical applications of ceramic, metal, and polymer biomaterials (Student Outcome j)

Correlation between course outcomes and student outcomes:

BMED 4751											
	Biomedical Engineering Student Outcomes										
Course outcomes	a	b	c	d	e	f	g	h	i	j	k
1					X						X
2	X										X
3		X									X
4										X	

The Wallace H. Coulter Department of Biomedical Engineering Student Outcomes:

a. an ability to apply knowledge of mathematics, science, and engineering;
b. an ability to design and conduct experiments, as well as to analyze and interpret data;
c. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, societal, political, ethical, health and safety, manufacturability, and sustainability;
d. an ability to function on multidisciplinary teams;
e. an ability to identify, formulate, and solve engineering problems;
f. an understanding of professional and ethical responsibility;
g. an ability to communicate effectively;
h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context;
i. a recognition of the need for, and an ability to engage in lifelong learning;
j. a knowledge of contemporary issues;
k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice;