

BE 4336
Biocompatibility & Surface Modification of Materials
Fall 2016

Instructor:

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Office hours: Thursday 10:30-12:00 or by appointment

Credit hours: 3 (Monday, Wednesday, Friday 9:30-10:30)

Course Description: This course is designed to establish fundamentals in biocompatibility (both immunocompatibility and functionality). We will cover basic principles of cellular biology to understand the interactions of cells with biomaterials employed for prostheses, tissue engineering, in addition to other medical therapies. *Prerequisite* BIOL 1201 and 1202

Course Objectives:

1. Understand concepts of biocompatibility:
 - a. immune response
 - b. physiological function of material
 - c. consideration for off target effects of biomaterials (mutagenesis, toxicity)
2. Understand concepts of biointerface
 - a. effects of biomaterial on cellular and tissue physiology
 - b. cellular incorporation
3. Understanding of biomaterials as they translate to the clinic
 - a. clinical trials, ethical issues, regulatory aspects

Text: There is no required text. The lectures for this course will be supplemented with reading material which will be provided in class and online.

Criteria for Determining Grade:

Journal review (15%): Students are required to present a review of a peer-reviewed journal article in addition to a one page write up of the article. Focus will be on evaluating methods for testing biomaterial compatibility employed by the authors.

Design Project (25%): Students will propose a product and design mechanism on how best to test that product for biocompatibility. Students will need to justify choice of tests (*in vivo* and *in vitro* methods used), discuss clinical aspects to consider, and rationale for expected cellular response. Project drafts due midnight of due date. Students will work in groups of 2.

Tests (60%): There are two exams each worth 30% of the final grade.

Grading Scale (%):

Above 98	A+
90.5-97.9	A
89.5-90.4	A-
88.0-89.4	B+
80.5-87.9	B

79.5-80.4	B-
78-79.4	C+
70.5-77.9	C
69.5-70.4	C-
68-69.4	D+
60.5-67.9	D
59.5-60.4	D-
Below 59.5	F

Date		Topic	Assignment
August	22	Introduction	
	24	Cellular biology review of key concepts	
	26	Host response: immune system	
	29	Acute and chronic response to biomaterials	
	31	Tissue/Biomaterial immune crosstalk	
September	2	Journal Review: <i>Immune response</i>	
	5	Labor Day holiday-No class	
	7	Sterilization and immune induced biomaterial failure	
	9	Journal Review: <i>Immune response</i>	
	12	Biomaterials for regenerative medicine and prosthetics	
	14	Tissues overview	
	16	Journal Review: <i>Prosthetics</i>	
	19	Wound healing: overview	
	21	Wound healing cont.	
	23	Regenerative components of biomaterials: biomolecules	
	26	Regenerative components of biomaterials: stem cells	
	28	Optimizing biomaterial for tissue specific induction	
	30	Journal Review: <i>Regeneration</i>	
October	3	Optimizing biomaterial for tissue specific induction cont.	
	5	Review	Design draft 1
	7	Fall Holiday-No class	
	10	Test 1	
	12	Maintaining function of a biomaterial-prosthetics	
	14	Journal Review: <i>Regeneration</i>	
	17	Maintaining function of a biomaterial-regeneration	
	19	Surface proteins and cell signaling	
	21	Surface proteins and biomaterials	
	24	Overview of cell types	
	26	Effects of biomaterial on cellular response	
	28	Journal Review: Matrix materials	
	31	Cancer background	
November	2	Cancer biomaterials	
	4	Journal Review: Matrix materials	
	7	Biomaterial off target effects	Design draft 2
	9	In vitro evaluation of biomaterials biocompatibility	
	11	Journal Review: Model testing	
	14	<i>In vivo</i> evaluation of biomaterials biocompatibility	

	16	Clinical trials and regulation	
	18	Journal Review: Clinical	
	21	Design presentation set 1	
	23	Review	
	25	Thanksgiving holiday- No class	
	28	Design presentation set 2	
	30	Design presentation set 3	
December	2	Design presentation set 4	
	5-9	Exam Week	