

Course: ChE 382 - Biomaterials

Semester: Spring 2011

Course Format

And Credit hours: Two lectures (75 min duration)/week, two case studies (total),
two demonstrations
Three-hour Credit

Prerequisites: ChE 381, BIOL 235 and PHYS 111

Instructor: Dr. Bingyun Li, 3938 Health Sciences Center South
304-293-1075, bli@hsc.wvu.edu

Schedule: Tuesday 9:30 to 10:45 AM
Thursday 9:30 to 10:45 AM

Location: Room 449 Engineering Sciences Building

Office Hours: Monday 1:00 – 3:00 PM
Wednesday 1:00 – 3:00 PM
or by appointment

Course Objectives: The objectives of this course are to introduce principles of materials science and cell biology underlying the design of medical implants and artificial organs. The topics covered include properties of living tissue, biocompatibility; polymers, metals, and ceramics as biomaterials; implants for hard and soft tissue.

Expected Learning

Outcomes: Upon completion of this course:

1. Students will be able to list and explain the important biomaterial characteristics, types of biomaterials, methods for selecting, producing, sterilizing, and characterizing biomaterials, and the applications of biomaterials.
2. Students will be able to understand and predict the interaction between various physiological systems and adjacent biomaterials; determine the appropriate technique needed for adjusting the interaction.
3. Students will be able to evaluate biomaterials for a given biomedical application.
4. Students will have gained an understanding of intelligently designed products requiring the use of biomaterials.
5. Students will demonstrate understanding of the broad ethical issues surrounding biomaterials selection and use.
6. Students will be able to design experiments that will provide

significant information regarding the biocompatibility of a material or medical device.

7. Students will effectively communicate their design of a biomedical device.
8. Students will understand governmental regulations regarding biomaterials use and understand how to gain governmental approval for use of a biomaterial or biomedical device.

Required Text:

Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen, and Jack E. Lemons. Biomaterials Science: An Introduction to materials in Medicine. 2nd edition. Academic Press, 2004.

Related Texts and Recommended Reading:

Kay C. Dee, David A. Puleo, Rena Bizios. An Introduction to Tissue-Biomaterial Interactions. John Wiley & Sons, Inc. 2003.

Jonathan Black. Biological Performance of Materials: Fundamentals of Biocompatibility, Third Edition. Marcel Dekker, Inc. 1999.

John G. Webster. Medical Instrumentation: Application and Design. Third Edition. John Wiley & Sons, Inc. 1998.

Journal Article handouts.

<u>Grading:</u>	3 Exams (@ 20 % each)	60 %
	Case Studies	20 %
	Homework and Quizzes	20 %
		<u>100 %</u>

<u>Grade Assignment:</u>	100 – 90 A
	89 – 80 B
	79 – 70 C
	69 – 60 D
	59 – 0 F

Grading Policy: No make-up exams except by prior arrangement with instructor
Late assignment = no assignment
Exam grading appeals in writing on the day the exam is returned.

HW Assignments: Homework assignments will be given approximately every week and each assignment will be worth approximately the same credit.

Quizzes: Short quizzes will be given once a week during the course. The total grade

for all quizzes will be 10% of the final grade.

Attendance Policy: Consistent with WVU guidelines, students absent from regularly scheduled examinations because of authorized University activities will have the opportunity to take them at an alternate time. Make-up exams for absences due to any other reason will be at the discretion of the instructor.

Social Justice Statement:

“West Virginia is committed to social justice. I concur with that commitment and expect to maintain a positive learning environment based upon open communication, mutual respect, and nondiscrimination. Our University does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sexual orientation, color or national origin. Any suggestions as to how to further such a positive and open environment in this class will be appreciated and given serious consideration.

If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class. Please advise me and make appropriate arrangement with Disability Services (293-6700).”

Course Schedule:

Week	Topic
1	Properties of Materials [1]
2	Classes of Materials Used in Medicine [2]
3	Classes of Materials Used in Medicine [2]
4	Surface modification approaches [2] and Practical Demonstration I (Surface modification)
5	Case Study I
6	“Catch-up” Review and EXAM I
7	Protein and Polypeptides, and Some background concepts [3]
8	Some background concepts [3], and Host Reaction to Biomaterials and their Evaluation [4]
9	Testing Biomaterials [5], and Degradation of Materials in the Biological Environment [6]
10	“Catch-up” Review and EXAM II
11	Spring Recess
12	Application of Materials in Medicine and Dentistry [7]
13	Application of Materials in Medicine and Dentistry [7], and Practical Demonstration II (<i>in vivo</i>)
14	Case Study II
15	Implants and Devices [9], and New Products and Standards [10]
16	Perspectives and Possibilities in Biomaterials Science [11], and “Catch-up” Review
17	FINAL EXAM (May 5, 2011)

[X] – where X is the Chapter in required text “Biomaterials Science: An Introduction to materials in Medicine” by Ratner, Hoffman, Schoen, and Lemons, 2nd ed. Academic Press, 2004.