

The University of Southern Mississippi
College of Science and Technology
Polymers and High Performance Materials

Course Syllabus - PSC 475

Biomaterials

Spring 2011

INSTRUCTOR: **Dr. Derek Patton**
Office: PSRC 184 (x4229)
E-mail: derek.patton@usm.edu
Office hours: M/W 8:50 – 9:50 or by appointment
Website: www.usm.edu/pattonresearchgroup (click on the courses tab)

CLASS MEETING

8:00 – 8:50 a.m. Monday/Wednesday/Friday
PSRC 105

TEXTBOOKS

Biomaterials Science : An Introduction to Materials in Medicine, 2nd Edition. by Buddy D. Ratner, Allan S. Hoffman, Frederick J. Schoen, Jack E. Lemons 2004, ISBN 0-12-582-463-7, (DNLM: I. Biocompatible Materials. QT 37 B6145 1996)

I. COURSE DESCRIPTION

2 hr. The course is an overview of use of materials in medicine from a scientific perspective.

II. COURSE OBJECTIVES AND OUTCOMES

This course is designed to provide a general understanding of the multidisciplinary field of biomaterials. Course materials will rely on general concepts learned in polymer and biology/biochemistry courses and will further extend the understanding about the interactions at the interface of material and biological systems. Current applications of biomaterials will be evaluated to provide an understanding of material bulk and surface properties, degradation processes, various biological responses to the materials and the clinical context of their use. The advanced study of multiple material systems applications will also provide an expanded understanding of how disciplines are merging to provide solutions for society while reinforcing the concept of self-learning.

III. COURSE TOPICS

- Polymer structure synthesis and degradation
- Biopolymers
- Inorganic materials, ceramics, metals, and combinations
- Surface modification of materials
- Tissue and material interaction
- Drug delivery and stimuli responsive polymers
- Application of materials in medicine

IV. INSTRUCTIONAL METHODS AND ACTIVITIES

Class lectures and readings.
Individual and group activities and discussions.

Help sessions will be arranged outside of class at the request of students.

V. EVALUATION AND GRADE ASSIGNMENT

90 - 100%	= A
80 – 89.99	= B
70 – 79.99	= C
60 – 69.99	= D
0 – 55.0	= F

Students are expected to work all assigned problems. Students are encouraged to work together on homework problems.

Some exams may be given as take-home exams. Students are expected to work independently on all examinations.

The grade for the course will be determined as follows:

Quizzes (4)	10%
Literature Reviews	20%
Class Participation	10%
Exam 1 (Midterm)	30%
<u>Final Exam</u>	<u>30%</u>
Total	100%

VI. Course Communication

Announcements will be made during class and by e-mail. All students must provide a current e-mail address and check it frequently.

VII. ATTENDANCE AND OTHER COURSE POLICIES

Students are expected to attend every class and attend on time. Problem sets will be administered about every two weeks and cannot be made up. A student who misses a quiz or a major test will receive a grade of zero. A student with an excused absence will be able to make up a major test (The test may differ in format).

The excused or unexcused status of an absence will only be considered after **written notice** of the absence including the reason for the absence has been submitted to the instructor. This must be submitted no later than the first class attended after the absence. **No absence will be considered as excused without written notice.**

More than three (3) absences for any reason is considered to be excessive. If circumstances place the student in a situation that involves excessive absenteeism, the student should plan on dropping the class before the drop date or ask for a withdrawal from the class after the drop date. Unless special circumstances are involved, no work, including exams, can be made up if more than three absences are on record. Communication and the timing of the communication are keys to acceptable outcomes. Poor timing or no communication will result in an unacceptable outcome.

If cellular phones are brought to class, please switch them to inaudible or off. Do not try to answer a

phone call while in the classroom. This behavior is distracting to others and can be disruptive. If you must respond to an anticipated emergency call, warn me that you may have to leave the classroom. **A cell phone that can be seen by the instructor during a quiz or test will be treated as a means to cheat and all applicable consequences related to academic dishonesty will be enforced.**

Class participation: Students are expected to be prepared for class and to respond to questions from the instructor. Reading the material in the text, working problems, listening in class, and studying notes should prepare the student for answering the questions.

VIII. ACADEMIC HONESTY

When cheating is discovered, the faculty member may give the student an F on the work involved or in the course. If further disciplinary action is deemed appropriate, the student should be reported to the dean of students. In addition to being in violation of academic honesty, cheating violates the code of student conduct and may be grounds for probation, suspension, or expulsion, or all three. Students on disciplinary suspension may not enroll in any courses offered by The University of Southern Mississippi.

IX. AMERICANS WITH DISABILITIES ACT STATEMENT

If a student has a disability that qualifies under the American with Disabilities Act(ADA) and require accommodations, he/she should contact the Office of Disability Accommodations(ODA) for information on appropriate policies and procedures. Disabilities covered by ADA may include learning, psychiatric, physical disabilities, or chronic health disorders. Students can contact ODA if they are not certain whether a medical condition/disability qualifies. Box 8586; Telephone (601) 266-5024; TYY (601) 266-6837; Fax (601) 266-6035.

X. COURSE OUTLINE (Spring 2011)

Focused Chapters/Sections

- Biomaterials Science
- A History of Biomaterials
- Part I
 - Properties of Materials
 - Classes of Materials Used in Medicine
- Part II
 - Some Background Concepts
 - Biomaterials Surfaces: Physics
 - Surface (vs. Bulk) Structure and Properties
 - Surface Energy
 - Adsorption, Segregation, and Reconstruction at Surfaces
 - Biomaterials Surfaces: Chemistry
 - Reactions at Surfaces
 - Surface Modification Methods Applicable to Biomaterials
 - Surface Characterization
 - Ex situ/in situ characterization
 - Protein-Surface Interactions
 - Host Reactions to Biomaterials and Their Evaluation
 - Biological Testing of Biomaterials
 - Degradation of Materials in the Biological Environment
 - Application of Materials in Medicine, Biology, and Artificial Organs
 - Tissue Engineering
 - Drug Delivery

- Practical aspects of Biomaterials
 - Implants, Devices, and Biomaterials: Issues Unique to this Field

Class Schedule*

PSC 475 Biomaterials, Spring 2011			
Date		Subject	Comments
1/19 – 1/21		Week 1	
1/24 – 1/26		Week 2	
1/28		No Class	HS Polymer Science Competition
1/31 – 2/4		Week 3	
2/7 – 2/11		Week 4	
2/14 – 2/18		Week 5	
2/21 – 2/25		Week 6	
2/28 – 3/4		Week 7	
2/28		Outside Reading (No Class)	Waterborne Symposium
3/2		Outside Reading (No Class)	Waterborne Symposium
3/4			
3/7-3/11		Week 8 No Class	Spring Break
3/14 – 3/18		Week 9	
3/16		Midterm Exam	
3/21 – 3/25		Week 10	
3/28 – 4/1		Week 11	
4/4 – 4/8		Week 12	
4/11 – 4/15		Week 13	
4/18 – 4/22		Week 14	
4/22		No Class	Easter Holiday
4/25		No Class	Easter Holiday
4/27 – 4/29		Week 15	
5/2 – 5/6		Week 16	
5/9		FINAL EXAM	8:00 a.m. – 10:30 a.m.

*Schedule may be revised if necessary. Students will be notified if this is the case.