

## Syllabus: EMA 6580 (Section 1G17) – Biomaterials – Spring 2014

1. **Course Description:** *Prerequisite:* (CHM2045 or CHM2095) or equivalent

Introduction to variables that control compatibility and performance of biomaterials, including physical and chemical properties, corrosion, fatigue, and interfacial histochemical changes. (3 Credit Hours)

2. **Course Objectives:** To present the fundamental concepts in biomaterials science and engineering. To describe the structure, properties, and applications of metallic, ceramic, polymeric and composite biomaterials. To generalize structure-property-performance interrelationships in biomaterials.

3. **Prerequisites:** CHM 2045 General Chemistry or CHM 2095 or equivalent

4. **Contribution of course to meeting the professional component:** This course provides 3 credits towards engineering sciences.

5. Instructor: **Dr. Chris Batich**

a. Office location: **MAE 317**

c. E-mail address: **cbati@ufl.edu**

d. Office hours: **TBA or by appointment**

6. Teaching Assistant: **TBA**

a. Office location: **TBA**

b. E-mail address: **TBA**

c. Office hours: **TBA**

7. Meeting Times and Location: **M-W-F Period 5 (11:45 am - 12:35 pm) – CSE E118**

8. No Textbook Recommended

9. **On the Web:** This course will use Sakai extensively as a *communication, homework and archival tool*. Students can access relevant course information via the **Sakai** entry link: <https://lss.at.ufl.edu/>.

10. **Conduct, Attendance and Expectations:** Proper behavior in class is always important and leads to a relaxed and productive educational environment. Thus, eating, drinking, texting, reading of newspapers, working on homework for this or other courses, or other activities that are not part of the class are not allowed. Students who do not comply with these requirements or who behave disorderly or disrespectfully may be asked to leave the classroom. Leaving your cell phone on, leaving early or arriving late can be VERY distracting. All electronic devices (PDAs, cell-phones, etc.) should be turned off or in silent mode. While not directly enforced, attendance is strongly suggested since significant amount of participative as well as individual and collaborative work will be performed during the class sessions and will be worth as much as 20% of the course points.

11. **Grading and Grading Scale:** Your final grade will be allocated based on the following distribution:

**Four In-Class exams: approximately 20% each. One project presentation 10%.  
(some leeway for participation etc.)**

**A** = 90%-100%; **B+** = 85%-89%; **B** = 80%-84%; **C+** = 75%-79%; **C** = 70%-74%; **D+** = 65%-69%; **D** = 60%-64%; **E** < 60%.

12. **Homework:** Homework exercises may be assigned throughout the course. Homework will not be collected or graded, but will be the basis for test questions.

13. **Course Outline:** Below is the tentative schedule of topics, activities, reading assignments and exams.

WEEK OF	TOPICS
1/6	• Introduction, materials used, central dogma, reading resources
1/13	• Natural biomaterials and polymeric biomaterials
1/20	<i>*No class Jan 20: Martin Luther King day</i> • Ceramic and metallic biomaterials • Exam Review
1/27	<b>EXAM 1 / January 27</b> • Degradation of biomaterials
2/3	• Degradation continued • types of biocompatibility, wound healing
2/10	• Histology • Failure analysis
2/17	• Soft tissue implants: TAH and LVAD • Exam Review
2/24	<b>EXAM 2 / February. 26</b> Artificial joints
3/3	<i>*No class March 1-8 – Spring Break</i>
3/10	• Tendons and ligaments
3/17	• Dental materials • Ophthalmologic materials
3/24	• Catheters, sensors
3/31	• Drug delivery <b>EXAM 3 / March 31</b>
4/7	
4/14	• Regulation of medical devices • Patents and development of materials and devices • Tissue engineering
4/21	• Tissue engineering continued • Ethical issues, student presentations on devices. Exam review
4/23	<b>Exam 4 / April 23</b>

### No Final Exam

14. **Honesty Policy** – All students admitted to the University of Florida have signed a statement of academic honesty committing them to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others.

15. **Accommodation for Students with Disabilities** – Students Requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.

16. **UF Counseling Services** – Resources are available on-campus for students having

personal problems or lacking clear career and academic goals. The resources include:

- University Counseling Center, 301 Peabody Hall, 392-1575, Personal and Career Counseling.
- SHCC mental Health, Student Health Care Center, 392-1171, Personal and Counseling Center for Sexual
- Assault/Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161, sexual assault counseling.
- Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.

**17. Software Use** – All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

**18. Course Premise:** better medical care will result from better use of materials. This can be facilitated if one has a good understanding of the molecular mechanisms involved in the good and bad responses of the material and the patient as they interact.

**19. Specific Class Goal:** to enhance a person's ability to function as a team member developing a new or improved medical device.

**20. Understanding and skills needed for that goal:**

1. Boundary conditions and trends (medical marketplace) e.g. < \$ 50,000/year of life extended.
2. Clinical need. What function needs to be replaced? Requires a reasonable knowledge of medical jargon to communicate well.
3. State-of-the-art. What are current devices, and what are their limitations? Requires knowledge of developmental history (what has been tried, and why has it not worked out?).
4. Mechanisms for limitations. E.g., not "heart valves fail" but rather: "mechanical heart valves have excessive bleeding complications."
5. Possible future alternatives. What new science or technology on the horizon will enable new devices? How can you use that science and technology for making better devices?