

BME 4931 Biomaterials for Regenerative Medicine

1. Catalog Description: This course introduces the students to biomaterials used in regenerative medicine and tissue engineering. This course will highlight chemical and physical properties of various natural and synthetic biomaterials, and how these features relate to choosing a material for a regenerative medicine application. This course will also provide tissue-specific examples of successful tissue regeneration.
2. Pre-requisites and Co-requisites: EMA3010 and EMA3066
3. Course Objectives:
 - a. to become familiar with different types of biomaterials used for regenerative medicine
 - b. to apply engineering principles to select materials for specific tissue regeneration applications
 - c. to understand methods to assess the clinical effectiveness of biomaterials in tissue regeneration
4. Contribution of course to meeting the professional component: N/A
5. Relationship of course to program outcomes: N/A
6. Instructor – Gregory A. Hudalla, Ph.D.
 - a. Office location: BMS J293
 - b. Telephone: (352) 273-9326
 - c. E-mail address: ghudalla@bme.ufl.edu
 - d. Class Web site: <http://elearning.ufl.edu>
 - e. Office hours: By appointment
7. Teaching Assistant – none
8. Meeting Times – Course meets 3 times per week, M W F 4th period
9. Class/laboratory schedule – Course meets three 50 minute periods per week
10. Meeting Location – CHE 316
11. Material and Supply Fees – none
12. Textbooks and Software Required

None
Reading materials will be provided via the course website.
13. Recommended Reading
 - a. Title – Biomaterials Science: An Introduction to Materials in Medicine
 - b. Authors – Ratner, B.D., et al
 - c. ISBN: 9780125824637

- a. Title – Tissue Engineering
- b. Authors – Bernhard O. Palsson and Sangeeta N. Bhatia
- c. ISBN number: 0-13-041696-7

- a. Title – Molecular Biology of the Cell
- b. Authors – Bruce Alberts
- c. ISBN number: 0-8153-3218-1

14. Course Outline (tentative)

Introduction

Week 1 (Jan 4): Overview of Tissue Engineering

why, what, how, where, and when of tissue engineering

Week 2 (Jan 11): What is a tissue? A review of extracellular matrix, cell, stem cells

Homework #1 due Friday Jan 15

Module 1 – Host-material interactions

Week 3 (Jan 18): Protein adsorption and cell adhesion (NOTE: No class on Jan 18)

Quiz #1 Friday Jan 22 in class

Week 4 (Jan 25): Host response to materials

Homework #2 due Friday Jan 29

Week 5 (Feb 1): Evasion of host responses – non-fouling surfaces; immunoisolation

Homework #3 due Friday Feb 5

Module 2 – Classes of Materials for TE/RM

Week 6 (Feb 8): Ceramics (M) and Metals (W)

Exam #1 Friday Feb 12 in class

Week 7 (Feb 15): Synthetic polymers

Week 8 (Feb 22): Natural biomaterials

Homework #4 due Friday Feb 26

Week 9 (Feb 29): **Spring Break – NO CLASSES**

Module 3 – Applications of Materials: From Replacement to Regeneration

Week 10 (Mar 7): Cardiovascular

Quiz #2 Friday Mar 11 in class

Week 11 (Mar 14): Orthopedic

Homework #5 due Friday Mar 11

Week 12 (Mar 21): Epithelial
Exam #2 Friday Mar 25 in class

Week 13 (Mar 28): Neural

Week 14 (Apr 4): Drug delivery
Homework #6 due Friday Apr 8

Week 15 (Apr 11): Regulatory considerations (M/W)
In-class Design Project (F)
Quiz #3 Friday Apr 15 in class

Week 16 (Apr 18): Discussion of In-class Design Projects (M)
Review Session (W)
Reading Day (F)

Week 17 (Apr 25): Final Exam – 28C – **Thursday Apr 28, 12:30-2:30 PM**

15. Attendance and Expectations:

- Be to class on time
- No cell phone disruptions or e-device distractions
- Turn in homework on time and make legible
- Better late than never
- Ask for help if you need it

16. Grading – methods of evaluation:

- Homework (6, lowest score of 6 will be dropped) – 2 pts per assignment, 10 pts total
- Quizzes (3, lowest score of 3 will be dropped) – 10 pts per quiz, 20 pts total
- Exams (2) – 20 pts per exam, 40 pts total
- Final exam – 30 pts total

Extra credit opportunities:

- *Regenerative Medicine in the News*, 1 point awarded per article (max 3 points)

17. Grading Scale

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
≥ 93	90- 92.99	87- 89.99	83- 86.99	80- 82.99	77- 79.99	73- 76.99	70- 72.99	67- 69.99	63- 66.99	60- 62.99	<60.99

A C- will not be a qualifying grade for critical tracking courses. In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). Note: a C- average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

18. Requirements for class attendance and make-up exams, assignments, and other work are consistent with university policies that can be found at:
<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>
19. Honesty Policy – UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.
- Note that failure to comply with this commitment will result in disciplinary action compliant with the UF Student Honor Code Procedures.
See <http://www.dso.ufl.edu/sccr/procedures/honorcode.php>
20. 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.
21. UF Counseling Services –Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
- UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, <http://www.counseling.ufl.edu/cwc/Default.aspx>, counseling services and mental health services.
 - Career Resource Center, Reitz Union, 392-1601, career and job search services.
- University Police Department 392-1111
22. 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.
23. Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results>.