

Science of Biomaterials
EMA 6580 (Sections 1FE2, 2FED, CAMP, OVER)
Class Periods: T:2-3 (8:30 – 10:25am) / R:3 (9:35 – 10:25am)
Location: TBA (Online)
Academic Term: Fall 2020

Instructor:

Laurie Gower, Professor of Materials Science & Engineering
Email Address: LGower@mse.ufl.edu
Office Phone Number: 352-846-3336
Office Hours: TBD; Zoom online

Teaching Assistants/Peer Mentor/Supervised Teaching Student:

Please contact through the Canvas website → N/A

Course Description

- Credits: 3 Grading Scheme: Letter
- Introduction to the six types of host response to biomaterials, and how the physical, chemical, and structural features of natural and synthetic biomaterials affect their performance in various biomedical applications.

Course Pre-Requisites / Co-Requisites

- (CHM2045 or CHM2095) or equivalent

Course Objectives

Students who complete Biomaterials will understand the following principles:

- Understand the fundamental principles in biomedical materials, material science and chemistry, and how they contribute to biomaterial development and performance
- Biomaterial degradation in the biological environment
- Wound healing and tissue remodeling in the absence and presence of implants
- Molecular and cellular interactions with biomaterials
- Comparative analysis of permanent, biodegradable and bioactive implants
- The fundamentals of tissue engineering and scaffold design

Materials and Supply Fees: NA

Recommended Materials

- For some topics, additional reading material will be provided by the instructor on the Canvas course website

- Title: Biomaterials Science : An Introduction to Materials in Medicine
Author: Buddy D. Ratner et al.
Publication date and edition: 2013, Third edition
ISBN number: 978-0123746269
Marston Science Library: R857.M3 B56 2013 (ONLINE)
eBook Permalink: <https://uf.catalog.fcla.edu/permalink.jsp?20UF031782461>

Course Schedule (Tentative*: 8/31/2020)

Lecture #	Month	Date	Subject	Reading Material
1	Sept.	T 1	Introduction	Book Intro. Section
2		T 1	Historical Perspective on Biomaterials	Chapt. 1.1 – 1.2
3		R 3	Fluorescence Microscopy	11.3.8, handout

		M 7	Labor Day Holiday	
4		T 8	Fluorescence: Confocal	11.3.8 , handout
5		T 8	Natural Materials: Biopolymers-Proteins	handout
6		R 10	Natural Materials: Protein structure	handout
7		T 15	Natural Materials: Polysaccharides	handout
8		T 15	Natural Materials: Polynucleotides	handout
9		R 17	Natural Materials: Lipids and Others	handout
10		T 22	Tissues & ECM	II.1.5
11		T 22	Hard Tissues of Bones & Teeth	handout
12		R 24	Protein Adsorption	II.1.1-II.1.2
13		T 29	Cells and surfaces and cell injury	II.1.3-11.1.4
14		T 29	Stem Cells	II.1.7
15	Oct.	R 1	Organs	II.1.7
16		T 6	Tissue Response to Injury	II.2.1
17		T 6	Host Reaction to Biomaterials	II.2.2
18		R 8	Defense System: Innate Immunity	II.2.3
		T 13	Exam 1 (covers lectures 1- 14)	
		T 13	Exam 1 (covers lectures 1- 14)	
19		R 15	Defense System: Adaptive Immunity	II.2.3
20		T 20	Systemic Toxicity and Hypersensitivity	II.2.5
21		T 20	Blood-Materials interaction	II.2.6
22		R 22	Tumorigenesis	II.2.7
23		T 27	Microbial Biofilms & Infection	II.2.8
24		T 27	Surface Properties of Materials	I.1.5: pp34-38
25		R 29	Surface Characterization – Contact Angle	I.1.5: pp38-40
26	Nov.	T 3	Physicochemical Surface Modification	I.2.10, 13, 17
27		T 3	Non-fouling surfaces	I.2.10, I.2.13, I.2.17
28		R5	Orthopedic and Dental Biomaterials	I.2.3 - I.2.4
29		T10	Orthopedic and Dental Biomaterials	I.2.3 - I.2.4
30		T 10	Hydrogels	I.2.5 - I.2.7
		M 11	Veterans Day Holiday	handout

31		R 12	Resorbable, Smart Systems	I.2.11, II.4
		T 17	Exam 2 (covers lectures 15- 29)	
		T 17	Exam 2 (covers lectures 15- 29)	
32		R 19	Textured, Porous, Fibrous Materials	I.2.15
		T 24	Project Teams Preparation	
		T 24	Project Teams Preparation	
		R 26	Thanksgiving Holiday	
	Dec.	T 1	Student Presentations	
		T 1	Student Presentations	
		R 3	Student Presentations	
		T 8	Student Presentations	
		T 8	Student Presentations	

*NOTE: This schedule serves as a guide to the subjects and approximate order in which they will be presented. However, depending on the interests of the class and available information, and the student needs and abilities, some subjects may be omitted and/or replaced as needed.

Attendance Policy, Class Expectations, and Make-Up Policy

- **Attendance and Expectations:** Attendance will not be formally monitored, but classroom contribution to discussions will be noted and taken into consideration for participation grade. Therefore, it is valuable to notify me of any absences that were necessary. Excused absences must be consistent with university policies in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>) and require appropriate documentation.
- **Homework:** Unless prior arrangements or an excused absence has been granted by the instructor, students will be deducted 2 letter grades for late coursework (grading will start at 75% [C]). The deduction occurs at the time the work is due. Once the assignment has been handed back and the key discussed, a zero will be assigned late assignments that are not excused. Students with an excused absence shall be permitted a reasonable amount of time to make up the material or activities covered in their absence.
- **Exams:** Only scientific non-programmable calculators are allowed during exams. Request one from me if you do not own or have access to one. A formula sheet will be provided during the exams (no notes or other sheets of paper should be present). A pen must be used for the final answer on the exams. Cell phones must be turned off and placed up-side-down during the exam.
- **Make-up Exam Policy:** Make-up exams will be provided with the prior approval of the instructor for excused absences. In general, acceptable reasons for excused absence include illness, serious family emergencies, special curricular requirements, military obligation, court-imposed legal obligations, religious holidays and participation in official university activities such as music performances, athletic competition or debate. If a make-up exam cannot be accomplished before the graded exams are returned, the missing exam score will be replaced by an average of the other two exam scores.
- **Grade changes:** Requests for adjustment to any grade should occur within the 2 week period following the posted grade in question, and must be approved by the course instructor.
- **Policy on Cell Phones:** Cell phones should be turned off or on vibrate mode during class, with the exception of a primary care giver, who should notify me in advance (if/when receiving a call, promptly move to outside the classroom). Texting during class is not allowed, and you may be asked to leave.

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (approx.. weekly)	variable	20 %
Exam 1	100	25 %
Exam 2	100	25 %
Project Report	100	15 %
Project Presentation	100	15 %
Total		100 %

Grading Policy

Percent	Grade	Grade Points
92 - 100	A	4.00
88 - 91.9	A-	3.67
84 - 87.9	B+	3.33
80 - 83.9	B	3.00
76 - 79.9	B-	2.67
72 - 75.9	C+	2.33
68 - 71.9	C	2.00
65 - 67.9	C-	1.67
62 - 64.9	D+	1.33
59 - 61.9	D	1.00
56 - 58.9	D-	0.67
0 - 55.9	E	0.00

More information on UF grading policy may be found at:

<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

Note: 2) For online courses with recorded materials:

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluer.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

University 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 (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-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.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use

All faculty, staff, and students 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.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

Campus Resources:

Health and Wellness

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://lss.at.ufl.edu/help.shtml>.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.
<https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.
<https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: <https://care.dso.ufl.edu>.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.