

Science of Biomaterials I: EMA 6580 (class number: Departmentally controlled)

Class Periods: M,W,F | Period 9 (4:05 PM - 4:55 PM)

Location: Room: CSE E112

08/23/2021 - 12/08/2021

Academic Term: Fall 2021

Instructor:

Chris Batich, Professor of Materials Science & Engineering

Email Address: cbati@ufl.edu

Office Phone: mobile 352-256-2397

Office Hours: TBD (can be done by Zoom)

Teaching Assistants: none

Course Description

– Credits: 3 Grading Scheme: Letter

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

Course Pre-Requisites / Co-Requisites

(CHM2045 or CHM2095) or an equivalent general chemistry class

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>
Note: there is a new edition also available at the library, but it is not preferred.

The modality of this class is synchronous live and remotely. All classes will be recorded and available for online viewing later. Depending on your situation, you may be required to attend one class later in the semester. According to our Academic Office: "Our fully online (100%) courses are reserved for students in our EDGE program only. [If] you are not in the EDGE program, you must be registered for the residential section which is 80-99% online.

Course Schedule (Tentative)

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, available information, and the student interests, some subjects may be omitted and/or replaced.

Week of:	Topic #
Aug. 23	Course Overview and Goals
	Setting goals for study: regulations (FDA and CMS)
	Metallics
Aug. 30	Metallics
	Ceramics
Sept. 6	<i>Labor Day Holiday</i>
Sept. 8	Bioactive glasses
	Dental implants
	Polymers
Sept. 13	Polymers
	Polymers
	Test #1
Sept. 20	Biological responses: foreign body response
	Wound healing
	Immunological response
Sept. 27	Coagulation and blood contact
	Cancer from biomaterials?
	Infections/sterilization
Oct. 4	Artificial Joints: hips and knees
	Artificial Joints: fingers and vertebrae
	HOLIDAY FOR HOMECOMING: OCT 8
Oct. 18	Heart valves
	Vascular grafts
	Endovascular devices (e.g., balloon angioplasty)
Oct. 25	Total artificial heart (TAH)
	Dialysis
	Test 2
Nov 1	Tendons and ligaments

Week of:	Topic #
	Tissue engineering
	Artificial Blood
Nov. 8	Contrast agents
	<i>Elastomers</i>
	Dental materials
Nov 15	Embolic agents
	Test 3
	Student presentations
Nov. 22	Student presentations
	<i>Wed. 24: Thanksgiving Holiday</i>
	<i>Fri. 26: Thanksgiving Holiday</i>
Nov. 29	Student presentations
	Student presentations
	Student presentations
Dec. 6	Student presentations
	No Final Exam

Attendance Policy, Class Expectations, and Make-Up Policy

- **Attendance and Expectations:** Attendance will not be formally monitored.
- **Exams:** No calculators or cell phones are needed.
- **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).

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 to 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>.

"In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code. "

Online Course Recording

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.

COVID-19

- You are expected to wear approved face coverings at all times during class and within buildings even if you are vaccinated.
- If you are sick, stay home and self-quarantine. Please visit the UF Health Screen, Test & Protect website about next steps, retake the questionnaire and schedule your test for no sooner than 24 hours after your symptoms began. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 (or email covid@shcc.ufl.edu) to be evaluated for testing and to receive further instructions about returning to campus.
- If you are withheld from campus by the Department of Health through Screen, Test & Protect, you are not permitted to use any on campus facilities. Students attempting to attend campus activities when withheld from campus will be referred to the Dean of Students Office.
- UF Health Screen, Test & Protect offers guidance when you are sick, have been exposed to someone who has tested positive or have tested positive yourself. Visit the [UF Health Screen, Test & Protect website](#) for more information.
- Please continue to follow healthy habits, including best practices like frequent hand washing. Following these practices is our responsibility as Gators.