

## Science of Biomaterials I: EMA 6580

**Class Periods:** Tuesday/Thursday, period 2/3  
(Tuesday- 8:30 am- 10:25 am, Thursday- 9:35 am- 10:25 am)

**Location:** CSE E107

**Academic Term:** Fall 2022

**I. Professor:**

Erika Moore (she/her/hers)

[moore.erika@ufl.edu](mailto:moore.erika@ufl.edu)

(352) 846-3328

Office Hours: To occur Thursdays 8:30 am – 9:30 am and via appointment

**II. Teaching Assistants:**

N/A

**III. Course Description**

(3 credit hours) – Materials commonly used for biomedical application, such as their properties from a biocompatibility or medical device perspective. In addition, materials interactions with biological systems are examined from the molecular (e.g., protein), cellular, tissue and systemic (whole body) perspective. This course serves as an introduction to biomaterials and the variables that control compatibility and biomaterial performance. Specific emphasis will be put on literature reviews, understanding the state of the field, and designing materials to further our understanding on the Science of Biomaterials.

**IV. Course Pre-Requisites / Co-Requisites**

(CHM2045 or CHM2095) or an equivalent general chemistry class

**V. 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

**VI. Materials and Supply Fees:**

None

**VII. Required Textbooks and Software**

Encouraged but not required:

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.

Necessary reference material will be provided throughout the class.

### VIII. Course Schedule (tentative and subject to change)

Week	Date		Topic (T)	Topic (T)	Topic (Th)
1	22-Aug	T/Th	<b>NO CLASS</b>	<b>NO CLASS</b>	Introduction/Course Overview + Goals
2	29-Aug	T/Th	History	Surface vs. Bulk	Surface vs. Bulk
3	5-Sep	T/Th	Biology/ECM	Guest Lecture- Industry	R21 Introduction/Session
4	12-Sep	T/Th	Protein/Material Interactions	Protein/Material Interactions	<b>Specific Aims Due</b>
5	19-Sep	T/Th	Metals	Metals	Metals
6	26-Sep	T/Th	Ceramics	Ceramics	Ceramics- Bioactive Glass
7	3-Oct	T/Th	Polymers	Polymers	Polymers
8	10-Oct	T/Th		<b>Significance/Innovation Due</b>	Guest Lecture- Networking
9	17-Oct	T/Th	Biological response to biomaterials	Wound Healing	Immunological Responses
10	24-Oct	T/Th	Infections/Sterilizations	Tissue Engineering	Cell-Material Interactions
11	31-Oct	T/Th	Cancer/Autoimmune from Biomaterials	Cell-Material Interactions	<b>Approach Draft Due</b>
12	7-Nov	T/Th		Guest Lecture- Clinician	Student Presentations #1
13	14-Nov	T/Th	Student Presentations #2	Student Presentations #3	Student Presentations #4
14	21-Nov	T/Th	<b>FULL Draft of Entire Grant DUE</b>	Guest- Applied Biomaterials	<b>NO CLASS</b>
15	28-Nov	T/Th	Student Presentations #5	Student Presentations #6	Student Presentations #7
16	5-Dec	T/Th	Student Presentations #8	<b>Feedback on all grants DUE</b>	<b>NO CLASS</b>

### IX. Class Policies (Attendance Policy, Class Expectations, and Make-Up Policy)

- A. Lecture Policy: Research shows students learn and retain information best taking notes by hand (see [Scientific American: A Learning Secret - Don't take Notes with a Laptop](#)). It is highly encouraged that each student put their phone away, turn off notifications on their computer and email, and close irrelevant windows when watching lectures or participating in a group setting for this class.
- B. Attendance Policy- Students are expected to attend lectures and participate in the form of quizzes, exams, and discussion sessions. Attendance during examinations will occur via Zoom, each student is expected to be present during examinations. Submission of tasks assigned including quizzes and discussion boards is expected prior to the submission deadline. **Excused absences must be consistent with university policies in the Graduate Catalog (<https://catalog.ufl.edu/graduate/regulations>) and require appropriate documentation. Additional information can be found here: <https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>**
- C. Class Expectations-

**Contacting the Professor**: Students should use Canvas to contact me. The university strongly encourages communication via Canvas to avoid the potential of violations of student confidentiality protected by FERPA. I strongly encourage students to attend virtual office hours (Thursdays at 8:30 am – 9:30 am) to discuss any questions or concerns regarding the course. If students do email me, they must use “EMA 6850” in the subject line to ensure a response.

**Messaging/Email Hours**: You may contact me via Canvas or email at any time that is convenient to you. I will respond within two business days between the hours of 9 am and 5 pm. If you do not receive a reply from me after 2 full business days, please resend your message. Responses cannot be guaranteed after 5 pm on weekdays, on weekends, or on academic holidays. Please plan accordingly to have your questions answered in advance of assignment and exam deadlines.

**Interpersonal Conduct**: Mutual respect for your classmates, myself, and yourself is expected in all communication; all class members are always expected to treat each other with respect, courtesy, tolerance, fairness, and justice.

**Effort**: The university recommends that students typically spend 9 to 12 h per week for a 3-credit class. This can of course vary but is a good initial guideline as the term begins.

**Recommendations for This Classroom**: For lectures, assignments, quizzes, and exams, it is in your best interest to ask questions or for clarification when content or a question is not making sense, so that we can review it or I can change approach.

**Referencing the Professor**: Often, students have questions over proper naming or titling etiquette for communicating with their professors. In all communication with me throughout the duration of our course, please refer to me as Dr. Moore or Professor Moore.

## X. Evaluation of Grades

Assignment	Percentage of Final Grade
Specific Aims Draft	15%
Significance/Innovation Draft	15%
Approach Draft	15%
Final Grant	20%
Participation (feedback, discussion)	20%
Quizzes (from student presentations)	15%
Total	100%

**Exams:** There will be no exams for this course.

**Canvas Quizzes & Discussion Prompts:** Lectures will periodically have an associated quiz, question, or discussion prompt, which must be completed prior to the deadline. Quizzes must be completed individually with no collaboration and should ideally be completed shortly or immediately after the lecture so the professor can assess what concepts or content should be revisited.

You have one week after any assignment is returned to resolve any questions about scores and grades. No changes to your assessment grades will be made after that time.

### Grading Policy

Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

The instructor reserves the right to adjust the grade distributions, however, grades will not be adjusted for individuals.

For more information on UF grading policy, please visit: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

## XI. 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 the instructor and discuss their access needs, as early as possible in the semester.

## XII. 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.bluera.com/ufl/> . Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/> .

### **XIII. 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.

### **XIV. 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 in this class.

### **XV. 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
- Jennifer Nappo, Director of Human Resources, 352-392-0904, [jpennacc@ufl.edu](mailto:jpennacc@ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto:nishida@eng.ufl.edu)

### **XVI. Software Use**

All faculty, staff, and students at 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.

#### **XVII. 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>

#### **XVIII. 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](mailto: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](mailto: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://www.dso.ufl.edu/documents/UF\\_Complaints\\_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).

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