

# Biomaterials Lab

EMA 4061L Section 26072

**Class Periods:** Tuesday, Period 7-9 (1:55pm-4:55pm)

**Location:** Rhines Hall Undergraduate Laboratory B06, lecture space in Weim 1092

**Academic Term:** Fall 2023

## **Instructor:**

Josephine Allen, Ph.D.

[jallen@mse.ufl.edu](mailto:jallen@mse.ufl.edu)

Office Hours: Office hours may be in person or via zoom. Time to be announced. Zoom link provided in CANVAS announcement.

## **Teaching Assistant/Peer Mentor/Supervised Teaching Student:**

Magnolia Jasper, [magnolijasasper@ufl.edu](mailto:magnolijasasper@ufl.edu), office hours in-person or via zoom, before class, Tuesday 1:00-1:55pm. If requesting zoom, please contact TA for zoom link.

## **Course Description**

Hands-on laboratory experience in the processing and characterization of biomaterials for use in medical applications. (1 credit hours)

## **Course Pre-Requisites / Co-Requisites**

Co-requisite EMA4061

## **Course Objectives**

The objective of this course is for students to become familiar with biomedical engineering experimental techniques and methods used to evaluate biomaterials for medical applications. Students will gain knowledge and learn advanced principles that are involved at the interface between a biomaterial and the living system. Student will review and design experiments as well as analyze and interpret data.

**Materials and Supply Fees:** \$80/student

## **Relation to Program Outcomes (ABET):**

The table below is an example. Please consult with your department's ABET coordinator when filling this out.

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Medium
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	Medium
3. An ability to communicate effectively with a range of audiences	Medium
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	Low
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	Low
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	High
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Medium

\*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

### ***Required Textbooks and Software***

No required textbook. Course material will be provided by the instructor.

### ***Recommended Materials***

Other reference material (i.e. literature manuscripts, video lab demonstrations etc.) will be used throughout the class. These will be indicated by the instructor and provided as used or needed.

### ***Course Schedule (Tentative)***

Week 1:	Module 1: Introduction to the lab
Week 2:	Module 2: Laboratory Safety
Week 3:	Module 3: Basic Laboratory Skills
Week 4-6:	Module 4: Cell Culture
Week 7:	Open Lab
Week 8-9:	Module 5: Cell-Material Interactions
Week 10:	Open Lab
Week 11-14:	Module 6: Biocompatibility
Week 13:	Thanksgiving Holiday (No Lab)
Week 15:	Lab Wrap Up and Shut down

### ***Descriptions of the Course Modules***

- ***Module I. Introduction to the Lab***

We will go over the course objectives, syllabus, expectations, grading etc. You will have a lab report, quiz, and discussion prompt for this module. This module will be open for 1 week.

- ***Module II. Laboratory Safety***

We will discuss safety aspects specific to the cell culture lab. Students will be instructed how to access the required online safety training, *General Biosafety/Blood Borne Pathogen (BBP)/Biomedical Waste (BMW) Training*. You will have a lab report, quiz, and discussion prompt for this module. This module will be open for 1 week.

- ***Module III: Basic Laboratory Skills***

Students will get familiar with the equipment and instruments that will be used in the lab. Skills include the use of pipettes, solution making, serial dilutions, and a microplate protein assay. You will have a lab report, quiz, and discussion prompt for this module. This module will be open for 1 week.

- ***Module IV: Cell Culture***

Students will learn the basics of culturing cells. Specifically aseptic technique, making media, thawing cells, caring for cells and maintaining cultures, passaging cells, counting cells, assessing live/dead cells, seeding cells and imaging of cells will be learned. You will have a lab report, quiz, and discussion prompt for this module. This module will be open for 3 weeks.

- ***Module V: Cell-Material Interactions***

This module will involve assessing cell adhesion, morphology, and proliferation on protein and polymer modified surfaces. Cell adhesion and morphology will be assessed via microscopy and image analysis via image J software. Proliferation will be assessed via microplate assay. You will have a lab report, quiz, and discussion prompt for this module. This module will be open for 2 weeks.

- ***Module VII: Biocompatibility Evaluation***

Assorted materials are tested for their cytotoxicity using *in vitro* cell culture methods, which include the direct contact method and the extraction method. You will have a lab report, quiz, and discussion prompt for this module. This module will be open for 3 weeks.

### ***Attendance Policy, Class Expectations, and Make-Up Policy***

This lab is a hands-on lab experience, **therefore attendance in Lab is required**. Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies: <https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>

We will make every attempt to provide an opportunity to make up a missed lab, however, this may not always be possible when working with live cells. Missed or late lab assignments as a result of an excused absence may be made up provided that appropriate documentation is submitted. Contact instructor to arrange the make-up. Missed or late assignments under any other circumstances will not be accepted.

Lectures, online demos, videos etc. will be posted online through Canvas prior to the lab. You are expected to view the lectures and lab materials for each module and complete any pre-lab assignments prior to coming into the laboratory. Our schedule is pretty tight, so there won't be time in lab for you to read the lab for the first time and figure out what you are doing for the day. **You are expected to come to lab prepared to start the lab right away.** Your lab assignments will be submitted through Canvas.

### ***Evaluation of Grades***

Assignment	Percentage of Final Grade
Canvas Discussion Board	10%
Lab Participation	5%
Lab Quizzes/Assignments	25%
Lab Reports	60%
<b>TOTAL</b>	<b>100%</b>

#### **Discussion Board:**

Throughout the course, questions related to experimental research will be posted on the Canvas Discussion Board. Your participation is required on these discussion posts. You are required to 1) post a new comment; and 2) post a comment in response to a classmate's comment. The discussion thread will stay open as long as the module is open. Some modules may have multiple discussion board prompts. **There will be 6-10 discussion threads.** Participation in the discussion threads will comprise 10% of your grade.

#### **Lab Participation:**

Students will work in groups of 3 or 4 throughout the semester, and these groups will remain the same throughout the semester. I expect equal effort and distribution of the group work among all members. Group engagement will be assessed via peer feedback as well as TA and instructor evaluations. The assessment of your participation will comprise 5% of your grade.

#### **Lab Quizzes/Assignments:**

You will be given pre-lab quizzes and assignments to complete prior to attending lab as well as post-lab assignments. The pre-lab quizzes are timed and based upon your understanding of the upcoming lab exercise. They may also be related to the demo/videos related to the lab exercise that may be posted through Canvas. The pre-lab quizzes will be administered via Canvas and will be due the Monday prior to the start of the lab module. **There will be at least 6 pre-lab quizzes.** Additional assignments post-lab or on Open lab weeks may be given. The quiz/assignment assessment combined will comprise 25% of your grade.

#### **Lab Reports:**

Following each lab exercise you will be expected to complete a lab report. While you work in groups in the laboratory and share the data collected within your group, the writing of the report is a solitary activity. No joint reports will be accepted. Additional details on Lab report format, grading, and expectations will be provided. Each module or lab will have a lab report; therefore **you will have 6 lab reports.** Lab reports will be due 1 week after the module or lab ends. The assessment of your lab notebook will comprise 60% of your grade.

## ***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

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

### ***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.

### ***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.ua.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.ua.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/process/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
- 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)

### ***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](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:** <https://counseling.ufl.edu>, 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://career.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://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>; <https://care.dso.ufl.edu>.

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