

Cell And Tissue Engineering

BME 6330 Section 11346

Class Periods: Tuesday, Period 8 – 9 (3:00 pm – 4:55 pm)

Thursday, Period 9 (4:05 pm – 4:55 pm)

Location: TBD

Academic Term: Spring 2024

Instructor:

Name: Prof. Edward Phelps

Email Address: ephelps@bme.ufl.edu

Office location and hours: BMS J383, by appointment

Course Description

Applying engineering principles, combined with molecular cell biology, to developing a fundamental understanding of property-function relationships in cells and tissues. Exploiting this understanding to manipulate cell and tissue properties rationally to alter, restore, maintain, or improve cell and tissue functions; and to design bioartificial tissue substitutes.

Course Pre-Requisites / Co-Requisites

Students with a basic knowledge of cell biology, biomaterials, and engineering principles should find themselves well-prepared for the information presented in this course. A prior course on cell biology covering content similar to Molecular Biology of the Cell, Alberts et al, ISBN-13: 978-0815344322 is recommended.

Course Objectives

- Identify fundamental engineering and biological concepts in tissue engineering and regenerative medicine.
- Understand and critically evaluate current approaches and issues in tissue engineering.
- Develop written and oral communication skills to discuss and analyze the scientific literature.

Homework / Readings: Reading of assigned research articles and/or resource material is required PRIOR to class. Assigned reading will serve as the basis for class discussion. An individual IMPACT STATEMENT (see below) for each assigned primary research paper must be submitted on the class website by 3:00PM (Tues) or 4:00PM (Thurs) prior to the start of class. There will also be graded homework assignments consisting of problem sets and/or writing objectives/milestones.

Impact Statement: For each assigned paper, provide a short paragraph (2-4 sentences) summarizing in your own words the main point of the paper and its impact/significance. Impact statements are not required for review papers, news and views articles, or essays. The impact statements must be submitted via the assignment tab in Canvas PRIOR to class. For formatting, list the LAST AUTHOR (in CAPS) followed by the impact statement for each paper. Impact statements are reviewed by the professor and count towards the class participation grade.

Review Paper: Students will conduct their own literature searches and write a review paper on an assigned tissue engineering related topic. Detailed instructions will be provided. Progress towards the final paper will be made via specific milestones due throughout the semester. Review papers will be peer-reviewed in class.

Exams: There will be two in-class exams. Exams will cover material from homework, assigned reading, and in-class lecture / discussion.

Class participation: Each week we will discuss assigned readings from the literature in class. The instructor will select students to lead the discussion during class without prior notice. All students will have the opportunity to participate and should come to class prepared to be called on. Unexcused absences, habitual tardiness, or leaving class early will negatively affect the class participation grade. See also, *Attendance Policy*.

Materials and Supply Fees

none

Required Textbooks and Software

None

Recommended Materials

Current or previous editions of the following texts are available as electronic resources through the UF library.

- *Tissue Engineering*, 2nd edition, Blitterswijk and De Boer, 2014, ISBN: 978-0124201453
- *Tissue Engineering: Engineering Principles for the Design of Replacement Organs and Tissues*, 2004, Saltzman, ISBN: 978-0195141306
- *Principles of Regenerative Medicine*, 3rd edition, Atala, Lanza, Mikos, and Nerem, 2018, ISBN: 978-0128098806

Course Schedule

See course website for the class schedule. The posted schedule is tentative and subject to change.

Discussion topics:

Intro to tissue engineering
Development / morphogenesis
Cell fate
Cell engineering
Extracellular environment
Organoids
Organs on a chip
Integration with living systems
Tissue specific case studies
Ethics and regulation

Additional topics added upon request or interest of the class, as time permits.

Attendance Policy, Class Expectations, and Make-Up Policy

Attendance Policy: Students are required to attend and actively participate in every class session, including asking and answering questions and contributing to class discussions. Class attendance and participation are monitored as part of the final grade. Class participation is assessed by readiness to lead discussion, ask questions, and engage in topical analysis with the instructor and fellow students. Missed class due to professional travel (e.g. interview, scientific conference, etc.) must be arranged with the instructor in advance and will only be granted on an individual case-by-case basis. Any missed assignments must be submitted in advance. Excused absences must be in compliance with university policies in the Graduate Catalog and require appropriate documentation.

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

Makeup policy: No late homework will be accepted or makeup exams allowed unless the missed assignment is due to a university excused absence. Missed assignments count for zero points.

Life happens policy: Students are permitted one unexcused class absence, no questions asked. This policy does not apply to exam days. All assignments due on the missed day must still be turned in electronically on time to receive credit. In addition, students are permitted one late homework assignment (up to 3 days late) and one missed impact statement, no questions asked.

Electronics policy: The use of personal electronic devices is not permitted in class unless for the sole purposes of: (1) notetaking, (2) referring to the text / figures of assigned readings during class discussion, (3) participation in class activities such as interactive response questions. The use of electronic devices for non-class related activities

(social media, web surfing, gaming, texting, etc) is not permitted and will result in your device being confiscated for the remainder of the class period.

Professional conduct: Students are expected to engage with the instructor and fellow students in a courteous and professional manner. Peer-evaluation and feedback should be respectful and constructive. Any student who behaves in a disrespectful or disorderly manner may be asked to leave the classroom.

Original work: Any material submitted to meet course requirements is expected to be the student's own original work. Cases of suspected plagiarism will be referred as academic misconduct to the appropriate university personnel. It is the student's responsibility clarify any questions about what constitutes plagiarism with the instructor PRIOR to submitting their assignment. Plagiarism and other instances of academic misconduct are clearly defined in the UF student code of conduct: <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>

Plagiarism:

Plagiarism is a common infraction to the UF Honor Code. If you are confused as to what constitutes plagiarism, see <https://guides.uflib.ufl.edu/c.php?g=147797&p=967443>. Plagiarism on any of your assignments **will be reported to the Dean of Students as a UF Student Honor Code violation**. Also, note that **copying solutions for any assignment, regardless of the source (e.g. other students, pirated website solutions, generative AI), will be treated as plagiarism**. If you have any questions or concerns, please consult with the instructor in this class. Note that failure to comply with this commitment will result in disciplinary action compliant with the UF Student Honor Code Procedures.

AI Policy

Generative AI is a powerful new tool that can help learners to engage with a topic of interest. Please be aware of the limitations of generative AI including the tendency to hallucinate (invent) *incorrect* responses including inventing fake citations. Many students believe AI tools are more trustworthy than they actually are.

Feel free to use AI tools/software:

- As part of your study regimen to help you better understand course material (keeping in mind AI can and does give incorrect responses)

Do not:

- Substitute AI for primary sources of information (textbooks, lecture materials, scientific literature).
- Use AI to do the writing of any substantive portion of an assignment for you. I will treat this as plagiarism and an honor code violation, the same as hiring any other external person, entity, or service to complete your assignments for you.

Communication: Please use only your official UF email address to communicate with Dr. Phelps. Include BME 6330 in the subject line. Although I do my best to answer email rapidly, please allow up to 24-48 hours for a response.

Website: We will use the official UF canvas site for all class activities. Assignments are required to be turned in online only. In the event of technical issues with the website please email your assignment to Dr. Phelps. Technical issues with online submission do not excuse late assignments.

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://gradcatalog.ufl.edu/graduate/regulations/>

Evaluation of Grades

50% Two in-class exams (25% each)

25% Review Paper

15% Homework

10% Class participation (attendance, discussion, and impact statements)

Grading Policy

The following is given as an example only.

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:

[UF Graduate Catalog](#)
[Grades and Grading Policies](#)

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

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.

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 varied perspectives and lived experiences within our community and is committed to supporting the University's core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

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
- HWCHE Human Resources, 352-392-0904, student-support-hr@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: <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

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 Connections 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: <https://distance.ufl.edu/getting-help/>; <https://distance.ufl.edu/state-authorization-status/#student-complaint>.