Cell and Tissue Engineering

BME 6330 Section 23311
Class Periods: Tuesday, Period 4 (10:40 AM – 11:30 AM)
Thursday Period 4 -5 (10:40 AM – 12:35 AM)
Location: HPNP 1101
Academic Term: Fall 2025

Instructor:
Name: Prof. Edward Phelps
Email Address: ephelps@bme.ufl.edu
Office Hours: BMS J383, by appointment

Course Description
Applying engineering principles, combined with molecular cell biology, to develop 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: 978-0393884821 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.

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*, 3rd edition, Blitterswijk and De Boer, 2022, ISBN: 978-0128244593
- *Tissue Engineering: Engineering Principles for the Design of Replacement Organs and Tissues*, 2004, Saltzman, ISBN: 978-0190286453
- *Principles of Regenerative Medicine*, 3rd edition, Atala, Lanza, Mikos, and Nerem, 2018, ISBN: 978-0128098806

Required Computer
Recommended Computer Specifications: https://it.ufl.edu/get-help/student-computer-recommendations/
HWCOE Computer Requirements: https://www.eng.ufl.edu/students/advising/fall-semester-checklist/computer-requirements/

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

Discussion topics:
Intro to cell and tissue engineering
Cell fate decision making

Genetic engineering
Stem cells
Extracellular environment
Organoids
Vascularization
Immune compatibility
Clinical and therapeutic applications
Cell manufacturing
Translation and regulatory concerns
Ethics
Additional topics added upon request or interest of the class, as time permits.

Important Dates
<Date 1> Exam 1 (TBD)
<Date 2> Project 1 Due (TBD)
December 11, 2025 Exam 2 (10:00AM-12:00PM HPNP 1101)

Evaluation of Grades
50% Two in-class exams (25% each)
25% Final project
15% Homework
5% Class participation (attendance, discussion, in-class assignments)
5% Reading assignments (impact statements and reading quizzes)

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

Attendance policy:
Students are required to attend class in-person and actively participate in every class session. Students will receive a class participation grade. Class attendance is monitored by contributing to the in-class discussions and completion of in-class assignments. Failure to participate, unexcused absences, habitual tardiness, or leaving class early will negatively affect the class participation grade.

Excused absence makeup policy:
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/. Missed class for professional reasons (e.g. interview, scientific conference, etc.) is considered excused but must be arranged with the instructor in advance.

- ***Class participation*** – Students with an excused absence are also excused from class discussion and in-class assignments on the days missed. No makeup is necessary. Grades for these days will be dropped.
- ***Exams*** – An out-of-class makeup exam must be arranged with the instructor to take place within 1 week of the original exam date. Makeup exams beyond 1 week can only be arranged for extenuating circumstances.
- ***Homework and Reading*** – If missing class due to an excused absences such as a light illness or professional travel, please turn in homework electronically via Canva on the normal due date. If more severe illness or extenuating circumstances result in inability to complete homework on time, arrange an alternative timeline with the instructor.

Life Happens policy:
I understand that life throws us all curveballs from time to time. You do not need to inform me you are using the policy, as it will be self-evident in the grade book, and I will adjust your grade accordingly. To accommodate the unexpected, students are permitted:

- One unexcused class absence. Participation grade will be dropped for one missed day. Does NOT apply to exams.
- One missed reading assessment. Reading grade will be dropped for one missed reading assignment.
- One late homework assignment. Must still turn in but one homework is accepted up to 3 days late for full credit.

Unexcused absence makeup policy:
Beyond the Life Happens policy, additional unexcused late or missing assignments count for zero points with no makeup possible. Use your Life Happens drops wisely.

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

Final Project: Students will conduct their own literature searches and write a final paper in which they design a solution to a major cell and tissue engineering problem. Detailed instructions will be provided. Progress towards the final project will be made via specific milestones due throughout the semester. White papers will be peer-reviewed in class.

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. The first few minutes of class will be reserved for writing an impact statement or responding to reading quiz questions.

Homework: There will be occasional graded homework assignments consisting of problem sets and/or writing objectives/milestones. Homework is turned in via Canvas.

Electronics policy: The use of personal electronic devices is permitted in class for the sole purposes of:
(1) notetaking, (2) participation in in-class activities. The use of electronic devices during class time for non-class related activities is not permitted and will result in you being asked to leave class for the day.

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.

Plagiarism/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. Plagiarism is a common infraction to the UF Honor Code and has been common problem in this course in the past. 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 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 *incorrect* responses including inventing non-existent 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 portion of any 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.

Because of past abuses of AI in this course, I will increase emphasis on in-class assignments on pen and paper.

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 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.

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

Academic Policies & Resources

To support consistent and accessible communication of university-wide student resources
https://go.ufl.edu/syllabuspolicies.

Commitment to a Positive 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.

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 Coordinator
- HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu