BIOE 476 Tissue Engineering- Fall 2024

Instructor

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Office Hours: Email Appointment.

Teaching Assistants

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Course Meeting Time

9:30-10:50 am Tuesdays/Thursdays; Room 3031 Campus Instructional Facility

Description

Principles underlying tissue structure-function relationships. Engineering methods for manipulating cellular environments. Quantitative cell and tissue characterization. Design and clinical translation of cell-based therapies.

Course Objectives

1. Define mechanisms of tissue development and tissue regeneration.
2. Understand principles underlying tissue structure-function relationships.
3. Understand methods for manipulating cellular environments.
4. Obtain skills for critical assessment of experimental design and analysis strategies.
5. Understand technological approaches for quantitative cell and tissue characterization.
6. Determine design parameters necessary for developing cell and tissue engineering-based therapies.

Required Textbook

None.

Reading material will be assigned from a combination of book chapters, review articles, and primary research papers.

Course Assessments

Exams

- Two mid-semester exams: Exam #1 Thursday 10/3; Exam #2 Thursday 11/21.
- Mid-semester exams are closed-book exams during the normal lecture period (9:30 am – 10:50 am).
- There is no final exam in the course.

Project Proposal Paper

- Students will organize into groups of approximately 5 students, select a tissue-engineering topic from a list provided, and prepare a proposal that designs an experiment to test a novel tissue engineering approach. Writing guidelines will be provided at a later date.

- Group project papers are due during finals week.

Homeworks

- Approximately 4 individual homework sets based on lectures and assigned reading material.
- 1 group homework- draft project proposal outline.
- For individual homework assignments: Students may discuss homework problems, but students must complete their own work and write up solutions independently.

Quizzes

- 8 multiple choice quizzes will be given throughout the semester. Quizzes will be related to lecture material from the preceding 1-2 weeks, and in some cases, the lecture pre-readings.

- Quizzes will be available on Canvas at 11 am on Thursdays and due at 9:30 am the subsequent Tuesday.

- Quizzes are open-notes. Only the final submission will be graded.

Grading

Homeworks (point total): 25%

Exam #1: 25%

Exam #2: 25%

Group Project Proposal Paper: 20%

Quizzes: 5%

- Gradebook: Canvas

- Letter grade determination:

>97% = A+; >93% = A; >89.5% = A-; >87% B+; >83% = B; >79.5% = B-; >77% = C+; >73% = C; >67% = C-

Campus Policies

Sexual Misconduct Reporting Obligation

The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University's Title IX Office. In turn, an individual with the Title IX Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options.

A list of the designated University employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here: wecare.illinois.edu/resources/students/#confidential.

Other information about resources and reporting is available here: wecare.illinois.edu.

Academic Integrity

The University of Illinois at Urbana-Champaign Student Code should also be considered as a part of this syllabus. Students should pay particular attention to Article 1, Part 4: Academic Integrity. Read the Code at the following URL: http://studentcode.illinois.edu/.

Academic dishonesty may result in a failing grade. Every student is expected to review and abide by the Academic Integrity Policy: https://studentcode.illinois.edu/article1/part4/1-401/. Ignorance is not an excuse for any academic dishonesty. It is your responsibility to read this policy to avoid any misunderstanding. Do not hesitate to ask the instructor(s) if you are ever in doubt about what constitutes plagiarism, cheating, or any other breach of academic integrity.

Religious Observances

Illinois law requires the University to reasonably accommodate its students' religious beliefs, observances, and practices in regard to admissions, class attendance, and the scheduling of examinations and work requirements. You should examine this syllabus at the beginning of the semester for potential conflicts between course deadlines and any of your religious observances. If a conflict exists, you should notify your instructor of the conflict and follow the procedure at https://odos.illinois.edu/community-of-care/resources/students/religious-observances/ to request appropriate accommodations. This should be done in the first two weeks of classes.

Disability-Related Accommodations

To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES, you may visit 1207 S. Oak St., Champaign, call 333-4603, e-mail disability@illinois.edu or go to https://www.disability.illinois.edu. If you are concerned you have a disability-related condition that is impacting your academic progress, there are academic screening appointments available that can help diagnosis a previously undiagnosed disability. You may access these by visiting the DRES website and selecting "Request an Academic Screening" at the bottom of the page.

Family Educational Rights and Privacy Act (FERPA)

Any student who has suppressed their directory information pursuant to Family Educational Rights and Privacy Act (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See https://registrar.illinois.edu/academic-records/ferpa/ for more information on FERPA.

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Course Schedule

Week Of	Modules	Tuesday (9:30-10:50)	Thursday (9:30-10:50)	Homeworks & Quizzes
8/26	1. Introduction: Cell-Based Therapies and Tissue Engineering 2. Tissue Organization	Module 1- Lecture	Module 2- Lecture	
9/2	3. Tissue Morphogenesis 4. Tissue Dynamics Reading: Van Blitterswijk (Tissue Homeostasis)	Module 3- Lecture Pre-reading: Paper #1	Module 4- Lecture	**Quiz #1 Due: Tuesday 9/3 9:30 am**
9/9	5. Stem Cells and Lineages 6. Cell Isolation and Culture	Module 5- Lecture Pre-reading: Paper #2	Module 6- Lecture	**Quiz #2 Due: Tuesday 9/10 9:30 am** **Homework #1 Due: Thursday 9/12, 11:59 pm**
9/16	7. Cell-Cell Communication 8. ECM and Natural Scaffold Materials Reading: Van Blitterswijk (ECM as Scaffold)	Module 7- Lecture	Module 8-Lecture	**Quiz #3 Due: Tuesday 9/17 9:30 am**
9/23	9. Synthetic Biomaterial Scaffolds 10. Scaffold Fabrication & Tailoring	Module 9- Lecture	Module 10- Lecture Pre-reading: Paper #3	**Homework #2 Due: Tuesday 9/24 11:59 pm** **Quiz #4 Due: Tuesday 9/24 9:30 am**
9/30	**Exam Week**	*Review for Exam*	**Exam #1 Thursday 10/3**	
10/7	11. Graft Rejection/Material Biocompatibility 12. Controlled Release/Drug Delivery	Module 11- Lecture	Module 12- Lecture	
10/14	13. Vascularization	Module 13- Lecture Pre-reading: Paper #4	** NO LECTURE* ** In-Classroom Office Hours to View Exam #1*	
10/21	14. Cell Migration 15. Cell Mechanics	Module 14- Lecture	Module 15- Lecture Pre-reading: Paper #5 (and associated questions)	
10/28	16. Microtechnology Tools I 17. Microtechnology Tools II	Module 16- Lecture	Module 17- Lecture	

Week Of	Modules	Tuesday (9:30-10:50)	Thursday (9:30-10:50)	Homeworks & Quizzes
11/4	18. Engineered Disease Models	** NO LECTURE (Election Day)*	Module 18- Lecture	
11/11	19. Case Study: Liver Cirrhosis 20. Tissue Engineering Ethics	Module 19- Lecture	Module 20- Lecture	
11/18	**Exam Week**	*Review for Exam*	**Exam #2 Thursday 11/21**	
11/25		Thanksgiving Break	Thanksgiving Break	
12/2	* One required project group meeting with assigned TA (Tsai, Paxhia) during this week.	Pre-scheduled project group meetings	Pre-scheduled project group meetings	
12/9		Project Office Hours: Course TAs (Optional- in classroom during normal meeting time)		
Finals Week			Written Project Proposal Due: *11:59 pm Thursday 12/19* (group submission in Canvas)	