BMEN 4314/5314 Tissue Engineering
Spring 2026

Welcome to UNT!

As members of the UNT community, we have all committed to being part of an institution that respects and values the identities of the students and employees with whom we interact. UNT does not tolerate identity-based discrimination, harassment, and retaliation. UNT's full Non-Discrimination Policy can be found in the UNT Policies section of the syllabus.

Instructor: Dr. Xiaodan Shi
Email: Xiaodan.Shi@unt.edu
Lectures: T and Th, 2:30-3:50 PM @ DP-B185
Office Hours: M and W, 1-2 PM @ DP-K240J or by appointment via email

Course Description

- Tissue engineering is increasingly viewed as the future of medicine. It is a significant area that provides new therapies for patients with severe injuries or chronic diseases. The successful development of tissue-engineered replacements depends on complementary advances in medicine, cell biology, material science, and engineering, as discussed in the course. This course is to develop the next generation of competent tissue engineers with a balanced background in both engineering and biology. To succeed in the course, students are expected to earn a grade of C or better in Human/Animal Physiology.
- Prerequisites: senior standing for 4314; graduate standing for 5314.

Learning Objectives

- This comprehensive course is designed for both senior-level and graduate-student study. This course covers the fundamental concepts, multidisciplinary approaches, and clinical applications of tissue engineering and regenerative medicine. The students are expected to gain a fundamental understanding of the structure-function relationship in normal and pathological mammalian tissues. The principles of tissue engineering, biological mechanisms, experimental, analytical, and computational approaches, animal models, and their respective clinical applications are integrated to address problems in the field of tissue regeneration.

Brief List of Topics:

- Cellular fundamentals of tissue engineering
- Soft and hard tissue structures and functions
- Materials used for tissue engineering
- Fabrication techniques
- Applications of tissue engineering
- Clinical translation and ethical issues in tissue engineering

Textbooks and Other Course Materials:

There is no required textbook. The content covered will be adapted from the textbooks and current literature. Lecture notes will be posted on Canvas as pdf files *after* each class.

- *Tissue Engineering* by Clemens van Blitterswijk, Peter Thomsen, et al. (Academic Press, 2008)
- *Principles of Tissue Engineering* by Robert Lanza, Robert Langer, and Joseph Vacanti (Academic Press, 2007)
- *Tissue Engineering: Engineering Principles for the Design of Replacement Organs and Tissues* by W. Mark Saltzman (Oxford University Press, 2004)

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- *Building Tissues: An Engineer's Guide to Regenerative Medicine* by Joseph W. Freeman and Debabrata Banerjee (CRC Press, 2018)

Major Assignments and Grading

	4314		5314	
Attendance	5%	(A ≥ 89.5 %)	5%	(A ≥ 91.5 %)
Homework and Quizzes	25%	(B 79.5 – 89.4 %)	25%	(B 81.5 – 91.4 %)
Exams	50%	(C 69.5 – 79.4 %)	50%	(C 71.5 – 81.4 %)
Group Presentation	10%	(D 59.5 – 69.4 %)	10%	(D 61.5 – 71.4 %)
TE Lab	10%	(F ≤ 59.4%)	10%	(F ≤ 61.4%)
Mini Presentation			2%	

Important Dates

2/17	Exam 1 (2:30-3:50 PM)
3/9-13	Spring Break, no class
3/24-26	TE Lab (subject to change)
4/2	Exam 2 (2:30-3:50 PM)
4/30	Group Presentation (subject to change)
5/5	Exam 3 (1-2:30 PM)

Course Policy

Communication Expectations and Attendance

- You are expected to check university emails and Canvas announcements on a regular basis. When you miss a class, you are expected to check the course calendar shortly after class to know about assignments, quizzes, and other materials. For quick questions, ***email via Outlook is preferred*** (Canvas messages may be missed), and you can expect a response within 24 hours during the work week (M-F). For involved questions or discussions, office hours are preferred.
- Research has shown that students who attend class are more likely to be successful. Total attendance counts for 5% of the final grade. Being punctual indicates our respect for others. If you are late, you are welcome to join the class, but please do so without distracting others.
- Attendance is mandatory. Arriving in the classroom more than 30 minutes late or leaving early will be considered absent. https://policy.unt.edu/policy/06-039

Homework and Quizzes

- Homework will be due at the designated time unless otherwise stated. *All homework must be submitted to Canvas in MS Word or PDF format.* Handwriting copies, photocopies, or email attachments will NOT be accepted.
- Quizzes will be given on Canvas periodically. For each quiz, you will have *two* timed (15-minute) attempts; the higher score will be kept. Pop quizzes may be randomly given in class (no make-up).
- Late policy: 2% deduction from the received *raw* score for every hour of delay.

- You have up to one week to request regarding the assignment (excluding the third exam) after grades are posted. The regraded new score will replace the old score. After one week, the grades are final.

Exams

- There will be three in-person, sectional, closed-book exams throughout the semester, i.e., each exam will cover materials from the previous lecture section only. Exam questions will be in the format of a combination of multiple-choice, true/false, fill-in-the-blanks, matching, short answers, etc.
- You will have *one* timed (80 minutes) attempt on each exam. Students who requested Alternate Testing accommodation from the Office of Disability Access (ODA) will have extra time on the timed exams. https://studentaffairs.unt.edu/office-disability-access/students/requesting-letters
- Late arrival to the classroom of more than 15 minutes will NOT be allowed to take the exam.
- All exams will be delivered via Respondus Lockdown Browser on Canvas and must be taken in person in the classroom. Taking the exam without coming to the classroom will result in a zero grade. You are expected to resolve any potential issues in advance, including compatibility, updates, and internet connectivity. No bio-breaks or use of other electronic devices during the exam period. Download the software: https://download.respondus.com/lockdown/download.php?id=165715487
- No make-up exams will be given without university-approved permission. https://policy.unt.edu/sites/default/files/06.039_StudAttnandAuthAbsence.Pub2_.19.pdf
- Students who have *more than two (three or more)* final exams scheduled on one day may request to reschedule one of the examinations on another day during the final examination period as follows: https://registrar.unt.edu/exams/exam-policies

Group Presentation and TE Lab

- All students are expected to work in groups to participate in two required group projects (i.e., group presentation and TE lab). More details for each assignment are available on Canvas.

Mini Presentation

- Graduate students are expected to briefly present novel topics of Tissue Engineering and Regenerative Medicine in class individually and periodically.
- The presentation should be concise with a focus on the general concept and completed in 4-5 minutes. The selected topic should have been released recently (ideally within the last 1-2 years) and reasonably relevant to the class discussion. More details for each assignment are available on Canvas.

Academic Integrity Policy

- According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to, ***cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage***. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University.

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- Turnitin will be applied for similarity checks and AI-assisted writing checks. You are encouraged to check the Turnitin scores after each submission. ***A higher than 10% similarity score OR AI score will be considered plagiarism and reported to the college.***

** This schedule is subject to change in any way that serves the educational needs of the students enrolled in this course.*

#	Date	Day	Tentative Topics	
1	1/13	T	Introduction, course overview	
2	1/15	Th	Cellular basics in TE	
3	1/20	T	Cell culture fundamentals	
4	1/22	Th	Cell culture fundamentals	
5	1/27	T	Cell culture fundamentals	
6	1/29	Th	Cell culture fundamentals	
7	2/3	T	Cell culture fundamentals	
8	2/5	Th	Stem cells as building blocks	
9	2/10	T	Stem cells as building blocks	
10	2/12	Th	Stem cells as building blocks	
11	2/17	T	**Exam 1**	
12	2/19	Th	Exam 1 Review + Stem cells as building blocks	
13	2/24	T	Stem cells as building blocks	
14	2/26	Th	Extracellular matrix in TE	
15	3/3	T	Extracellular matrix in TE	
16	3/5	Th	Extracellular matrix in TE	
17	3/10	T	No class, spring break	
18	3/12	Th	No class, spring break	
19	3/17	T	Extracellular matrix in TE	
20	3/19	Th	Extracellular matrix in TE	
21	3/24	T	TE Lab	
22	3/26	Th	TE Lab	
23	3/31	T	Microfabrication	
24	4/2	Th	**Exam 2**	
25	4/7	T	Exam 2 Review + Microfabrication	
26	4/9	Th	Bioreactors	
27	4/14	T	Bioreactors	
28	4/16	Th	Bioreactors	
29	4/21	T	Organ Transplant and Ethics in TE	
30	4/23	Th	Organ Transplant and Ethics in TE	
31	4/28	T	TBD	
32	4/30	Th	Topic Presentation Day (@10:30 pm and @2:30 pm)	
33	5/5	T	**Exam 3 (1-2:30 PM)**	