BMEN 3310 Engineering Measurements from Human Systems (Fall 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
Office Location: Discovery Park K240 J
Office Hours: Thursday 2-4 PM, or by appointment via UNT email
Lectures: M/W 12:55-1:45 PM @ Discovery Park K120

Teaching Assistants:

Sara Swank (SaraSwank@my.unt.edu), section 301
Sachin Kaluarachchi (SachinKaluarachchi@my.unt.edu), sections 302 & 303
Lab location: Discovery Park E225B (*No labs in the first week; all labs start from the second week*)

Course Description:

- Introduction to understanding mammalian physiology and the engineering aspects of different physiological systems. Focuses on several organ systems, including cardiovascular, respiratory, renal, etc. Introduction to the basic concepts of human anatomy. The gross anatomical features of the body systems are presented together with relevant developmental, histological, functional, and clinical facts.
- Prerequisites: BMEN 1300, BMEN 2320, BIOL 2301, BIOL 2311

Course Objectives:

- Upon successful completion of this course, students will (1) understand the functions of the body, including the major systems of the body, cellular biology, and specific organs of the body; (2) learn (and demonstrate what they learned) about homeostasis, (un)common ailments, and current remedies to improve the life of one afflicted; (3) apply this knowledge by designing and presenting a mechanical or technical resolution to a sickness, malformation, or other physical ailment of the body; (4) participate in a concurrent lab by working in groups to learn software that interfaces with and demonstrates the intricacy of the human body.
- ABET Outcome 1: an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- ABET Outcome 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.

Brief List of Topics to Cover

- Membrane Transport, Tissues and ECM, Skeletal System, Cardiovascular System, Renal System, and Respiratory System

Course Materials

- No required textbooks. After each lecture, all course materials will be posted on Canvas, including lecture notes, slides, assignments, readings, and other relevant resources.

- A preview version of the slides for each upcoming topic will be posted on Canvas before the topic begins. You are expected to review these slides before class. This preparation is essential for developing the foundational understanding needed to follow the lecture and participate effectively in class activities and discussions.
- Recommended references: *Human Physiology – An Integrated Approach 6th Edition* by Dee Unglaub Silverthorn (ISBN 10: 0-321-75007-1)

Major Assignments and Grading:

• Homework and Quizzes	20%	A	89.5 – 100%
• Laboratory	20%	B	79.5 – 89.4%
• Two Exams	40%	C	69.5 – 79.4%
• Final Group Project	15%	D	59.5 – 69.4%
• Attendance	5%	F	< 59.5%

Important Dates

• Labor Day	9/7 (M, no class)
• Exams 1 & 2	9/28 & 11/18
• Project Team Formation	Due 9/13 at midnight
• Project Topic Selection	Due 9/27 at midnight
• Project Checkpoints & Drafts	Due 10/18 & 11/15 at midnight
• Thanksgiving Holiday	11/24-28 (no class)
• Final Project Presentation	12/2 (W, 12:55-1:45 PM) & 12/3 (Th, 10:40-1:30 PM)
• Final Project Technical Brief & Self Reflection	Due 12/6 at midnight

<u>Course Policy</u>

Communication Expectations

- You are expected to check university emails and Canvas announcements regularly. When you miss a class, you are expected to check the course calendar shortly after class to know about assignments, quizzes, and other materials. *Email via Outlook is preferred* for quick questions, and you can expect a response within 24 hours during the workweek (M-F). Office hours are preferred for questions or discussions that are not suitable for the TA.

Homework and Quizzes (20%)

- Homework will be due at the designated time unless otherwise stated. All homework should be submitted to Canvas as *MS Word or PDF files.* Handwritten copies, photocopies, or email attachments will NOT be accepted.
- Quizzes will be given on Canvas periodically. For each Canvas quiz, you will have *two* timed attempts (15 minutes each); the higher score will be retained. Pop quizzes may be *randomly* given in class for bonus credits. After the graded quiz is closed, you may use the non-graded practice quiz to review quiz questions.
- Late policy: 1% deduction from original score per hour of lateness for up to three days after due time.

Exams (40%)

- Two *in-person*, *sectional, closed-book* exams will be given throughout the semester. Each exam will cover only material from the previous lecture section; there will be no cumulative exams. Exam questions may include multiple-choice, true/false, fill-in-the-blank, matching, short-answer, calculation, and other types.

- For each exam, you will have *one* timed attempt. Students who requested Alternate Testing accommodation from the Office of Disability Access (ODA) will have extra time for timed exams. You are responsible for contacting the ODA office and testing center to schedule the tests. https://studentaffairs.unt.edu/office-disability-access/students/requesting-letters
- All exams will be delivered via *Respondus Lockdown Browser* on Canvas and must be taken *in person in the classroom*. You are expected to resolve any potential technical difficulties in advance, such as compatibility issues, updates, and internet connection problems. No use of other devices or bio-breaks (without ODA accommodation) is allowed during exams. Download the software: https://download.respondus.com/lockdown/download.php?id=165715487
- Make-up exams will NOT be given without UNT-approved excuses. https://policy.unt.edu/policy/06-039

Attendance and Punctuality (5%)

- Consistent attendance is key to your success. You are expected to participate in every class unless you have a UNT-approved absence. To maintain a respectful learning environment, we enforce the following policies: before 1 PM, sign in for full credit; before 1:20 AM, sign in for partial credit; after 1:20 AM, you are still welcome to sit down and learn; however, you will be counted as absent.

  Signing in for an absent or late classmate violates the UNT Academic Integrity Policy. Both students will receive a zero for their overall attendance grade and be reported to the university.
- Everyone gets two "free passes" throughout the semester, which automatically excuse your first two unexcused absences or late arrivals past 1:20 PM. No need to email; it will apply at the end of the semester.
- If you cannot attend a class due to an emergency, official documentation must be submitted via UNT email either *prior to class* or *within 48 hours* after the absence. Retroactive excuses at the end of the semester will NOT be processed. For a list of acceptable excused absences, refer to the UNT policy https://policy.unt.edu/policy/06-039

Final Group Project (15%)

- You are expected to work in a team with fellow students to conceptually design an implantable medical device. Each team will identify an existing design as a baseline and propose a meaningful functional or performance-related modification.
- Each team will develop and compare at least two design alternatives, select a final concept using measurable requirements, and use an appropriate engineering tool (such as modeling, simulation, CAD software, etc.) to support one design decision.
- Each team will submit three progress checks (i.e., an early direction checkpoint, a technical brief draft, and a presentation slide draft), write a concise team technical brief, a 10-12 minute team presentation, and an individual contribution/reflection form.
- Most project points are based on the team's work; however, individual project grades may differ based on documented participation and contribution.

UNT Policy

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.

- Generative-AI tools may be used for brainstorming and limited editing, such as grammar, spelling, punctuation, formatting, or similar support. However, they must not produce the substance of engineering work. The analysis, design decisions, conclusions, and other technical work must be the team's own.
- For writing assignments, a Turnitin similarity score above 20% (excluding bibliographic materials) will prompt a review and further conversation. If a Turnitin AI-writing score is elevated, you may be asked to provide relevant original drafts, version history, notes, or other documentation of its writing and design process. These materials may be used as supporting evidence to help assess the extent of the team's independent work. Grade consequences follow only from confirmed misconduct under UNT Policy 06.003.

Prohibition of Discrimination, Harassment, and Retaliation

- The University of North Texas (UNT) prohibits discrimination and harassment because of race, color, national origin, religion, sex, sexual orientation, gender identity, gender expression, age, disability, genetic information, veteran status, or any other characteristic protected under applicable federal or state law in its application and admission processes; educational programs and activities; employment policies, procedures, and processes; and university facilities. The University takes active measures to prevent such conduct and investigates and takes remedial action when appropriate. https://policy.unt.edu/policy/16-004

ADA Policy

- UNT makes reasonable academic accommodations for students with disabilities. Students seeking accommodation must first register with the Office of Disability Access (ODA) to verify their eligibility. If a disability is verified, the ODA will provide a student with an accommodation letter to be delivered to faculty to begin a private discussion regarding one's specific course needs. Students may request accommodations at any time; however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member before implementation in each class. For additional information, see the ODA website (https://disability.unt.edu/).

Course Safety Procedures (for Laboratory Sections)

- While working in laboratory sessions, students enrolled in BMEN 3310 are required to follow proper safety procedures and guidelines in all activities requiring lifting, climbing, walking on slippery surfaces, using equipment and tools, handling chemical solutions, and hot and cold products. Students should be aware that UNT is not liable for injuries incurred while students are participating in class activities. All students are encouraged to secure adequate insurance coverage in the event of accidental injury. Students who do not have insurance coverage should consider obtaining Student Health Insurance. Brochures for student insurance are available in the UNT Student Health and Wellness Center. Students who are injured during class activities may seek medical attention at the Student Health and Wellness Center at rates that are reduced compared to other medical facilities. If students have an insurance plan other than Student Health Insurance at UNT, they should be sure that the plan covers treatment at this facility. If students choose not to go to the UNT Student Health and Wellness Center, they may be transported to an emergency room at a local hospital. Students are responsible for expenses incurred there.

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

#	Date	Day	Tentative Lecture Schedule	Tentative Lab Schedule
W1	8/17	M	Syllabus + Introduction	No labs in 1st week
	8/19	W	Introduction + cell basics recap	
W2	8/24	M	Cell basics recap	MATLAB Refresher
	8/26	W	Membrane transport -1	
W3	8/31	M	Membrane transport -2	VCell
	9/2	W	Membrane transport -3	
W4	9/7	M	Labor Day	Diffusion and osmolarity
	9/9	W	Membrane transport -4	
W5	9/14	M	Membrane transport -5	Anatomage body systems
	9/16	W	Tissues and ECM	
W6	9/21	M	Bone and joint -1	SolidWorks/CAD
	9/23	W	Bone and joint -2	
W7	9/28	M	Exam 1	Introduction to COMSOL
	9/30	W	Exam 1 Review	
W8	10/5	M	Cardiovascular - 1	Blood vessel simulation
	10/7	W	Cardiovascular - 2	
W9	10/12	M	Cardiovascular - 3	Heart simulation
	10/14	W	Cardiovascular - 4	
W10	10/19	M	Cardiovascular - 5	Pacemaker simulation
	10/21	W	Cardiovascular - 6	
W11	10/26	M	Renal -1	ANSYS
	10/28	W	Renal -2	
W12	11/2	M	Renal -3	Project workshop
	11/4	W	Respiratory -1	
W13	11/9	M	Respiratory -2	Renal and/or Respiratory
	11/11	W	Respiratory -3	
W14	11/16	M	(Integration)	Project workshop
	11/18	W	Exam 2	
W15	11/23	M	Thanksgiving Holiday	
	11/25	W	Thanksgiving Holiday	
W16	11/30	M	Final Project Work & Refinement	
	12/2	W 12:55-1:45 PM	Group Presentation (4 groups)	
	12/3	Th 10:40-1:30 PM	Group Presentation (remaining groups)	