

BMEN 4212 Senior Design I
Fall 2025

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, or retaliation. UNT's full Non-Discrimination Policy can be found in the UNT Policies section of the syllabus.

Instructor: Dr. Xiaodan Shi Xiaodan.Shi@unt.edu

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Lecture Schedule: F, 9:30-11:20 AM @ DP-K120

Lab Section 302: W, 2:30-5:20 PM

Lab Section 303: F, 5:30-8:20 PM

Lab Section 305: M, 2:30-5:20 PM

Office Hours: Dr. Shi: Th, 1-3 PM @ DP-K240J

Nicole: @ DP-E215J

Textbook: None

Course Description

- Team biomedical engineering design project involving the development of a problem statement, alternative approaches for a solution, product portfolio, specific system analysis, and design.
- Prerequisites: BMEN 3310, BMEN 3350, BMEN 3311, BMEN 3312, BMEN 3321; senior classification.

Course Objectives

- Upon successful completion of this course, students will be able to: (1) Develop a product or process portfolio with a marketing plan. (2) Develop an understanding of the product development cycle from inception to a test model as used in an industrial setting. Develop an appreciation of a team effort in product development. (3) Prepare a formal technical document covering the actual design. (3) Learn the process of utilizing catalogs, specification sheets, and vendor documents in the design process. (4) Learn to apply the breadth of the major engineering technology courses to the completion of the final design. (5) Develop an appreciation for the requirements and techniques of an oral presentation covering a group effort. (6) Develop an appreciation for the free market system.

ABET Outcomes: 1, 2, 3, 4, 5

- Outcome 1: Ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- Outcome 2: Ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
- Outcome 3: Ability to communicate effectively with a range of audiences.
- 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.

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- Outcome 5: Ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

Brief List of Topics to Cover

- Engineering design project involving the development of alternative approaches for solutions.
- Implementation of design techniques and error analysis.
- Teamwork, leadership, collaboration, etc.
- Academic style writing and presentation.

Major Assignments and Grading Policy

• Attendance	5%	A	89.50 – 100%
• Lab Assignments	5%	B	79.50 – 89.49%
• Weekly Assignments	10%	C	69.50 – 79.49%
• Elevator Pitch	30%	D	59.50 – 69.49%
• Technical Proposal	30%	F	≤ 59.49%
• Two Progress Presentations	10%		
• Faculty Advisor/Sponsor Feedback	5%		
• In-Group Peer Evaluation	5%		

Important Dates

- | | |
|-----------------------------|---|
| • 1st Progress Presentation | Oct. 10 |
| • 2nd Progress Presentation | Nov. 15 |
| • Thanksgiving Holiday | Nov. 28, no class |
| • Reading Day | Dec. 5, no class |
| • Elevator Pitch | Dec. 10 (8-10:30 AM, subject to change) |

Senior Design Expectations

- Senior design projects require a **fully functional prototype** that aims to address a biomedical engineering need.
- It is important for students to note that sometimes a sponsor's project goals or expectations do not meet the minimum requirements for a senior design project. In the case that a sponsor's project outcomes do not meet senior design project expectations, then the students must create their own goals and expectations that will satisfy the senior design requirements.
- Feel free to reach out for further clarification on specific projects.

Course Policy

- You are expected to regularly check university emails and Canvas announcements (make sure to turn push notifications on!). When you miss a class, you are expected to check the course calendar shortly after class to be aware of new announcements, assignments, and other materials. *Email via Outlook is preferred* for quick questions, and you can expect a response within 24 hours during the work week (M-F). For involved questions or discussions, office hours are preferred. Being punctual indicates our respect for others.
- Attendance (lectures and labs) is mandatory unless you have a UNT-approved absence, including illness, active military services, religious holy day, etc. Please provide us with a copy of the official documentation at your earliest convenience. Please arrive before class begins to find a seat. Being late

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to class is sometimes inevitable. If you are late, know that you are welcome to join the class, but please do so without distracting others. You will be counted absent if you are more than 30 minutes late. <https://policy.unt.edu/policy/06-039>

- Late policy: 2% of the received score will be deducted for every 12-hour delay; submissions late more than 50 hours will result in a zero grade.
- Turnitin will be applied for writing assignments to prevent unnecessary plagiarism. A similarity score or AI-generated writing score of 10% or higher will be considered plagiarism and academic dishonesty.

Lab Policy

- As a senior, it is important to respect UNT BMEN property. You have access to the teaching labs even when there is no TA present. However, this privilege may be revoked if you do not conduct yourself properly while in the lab or exhibit destructive behavior towards BMEN property.
- To succeed in Senior Design I and II, it is crucial to engage fully in all laboratory activities. These activities are designed to support your learning, so it's essential to work collaboratively with your team throughout the entire lab session.

UNT Academic Integrity Policy

- Academic Integrity Standards and Consequences. 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.

UNT 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. Students must obtain a new letter of accommodation for every semester and 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 4212 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

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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.

Emergency Notification & Procedures

- UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to the UNT Learning Management System (LMS) for contingency plans for covering course materials.

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>

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The schedule is subject to change by any means that serves the best of the course.

Week Number	Tentative topic schedule	Tentative lab schedule
1, 8/22	Welcome back, and what is expected	No labs in the first week
2, 8/29	Project pitch from sponsors	Logo design
3, 9/5	(Project pitch and) experience share	Reference managers and finding sources
4, 9/12	Meeting minutes, deliverables, Gantt Chart	Word and PowerPoint templates
5, 9/19	Societal and cultural impact	FDM Printing
6, 9/26	Economic impact	SLA Printing
7, 10/3	Schematics review	Electronics and Arduino
8, 10/10	First Progress Presentation (literature review, background study, clinical importance, societal impact, etc.)	Soldering
9, 10/17	FDA and applicable standards	SolidWorks Refresher
10, 10/24	Testing and validation	COMSOL and Computations
11, 10/31	Abstract, results, and conclusion	Statistical Analysis
12, 11/7	Risks and constraints	Practice Presenting, Writing Workshop
13, 11/14	Second Progress Presentation (initial design with schematics)	Practice Presenting, Writing Workshop
14, 11/21	Up-Goer challenge	Practice Presenting, Writing Workshop
15, 11/28	Thanksgiving Holiday	
16, 12/5	Reading day, no class	Practice Presenting, Writing Workshop
17, 12/10	Elevator Pitch	