

## 1. Introduction

UNT has opened its new \$12.6 million biomedical engineering building where glass-walled, open concept labs and classrooms create a transparent and collaborative environment for cutting-edge research and learning. The 26,250-square-foot building is located on UNT's Discovery Park campus and provides faculty and students with modern classrooms, research labs, facilities for microscopy, cell culture and optics as well as teaching labs and a senior design lab. The new labs feature hi-tech instruments such as a bio 3D printer that prints cells mimicking human tissue and a 3D virtual dissection table that allows students to delve inside the human body without a scalpel. Inside research labs, faculty investigate exoskeleton technology that may someday help people with limited mobility; develop nanotechnology and optics to diagnose cancer; and biopolymers and flexible bioelectronics that may help doctors deliver medications and manage illnesses.

Faculty and students in UNT's Department of Biomedical Engineering are heavily involved in research and project-based learning initiatives. Some research areas studied in the department include:

- Biopolymers and Flexible Bioelectronics
- Biotechnology
- Medical Imaging
- Electrophysiology
- Micro and Nanoengineering in Medicine
- Nano biomaterials and Nanomedicine
- Biomechanics / Orthopedic Research
- Vital Sign Monitoring
- Exoskeletons

## 2. Graduate program timelines/sequences

Our department is offering a PhD program and a MS program with thesis option and non-thesis option.

A MS program typically takes 2 years to complete. Here are the degree plans:

### Thesis Option:

The Thesis Option requires strong academic standing, and 6 credits of BMEN 5950 with a Major Professor. Typically, a student will enroll in BMEN 5950 in two consecutive semesters (3 credits each) in the second year of the program. During the first 3 credits of BMEN 5950, the student and Major Professor define a Thesis Proposal, and the student presents the Proposal to a faculty Thesis Committee for approval.

Course offerings vary from year to year and are based on enrollment and resources. The Major Professor and the student are advised to tailor the degree plan based on course availability. Courses registered without Advisor's approval or any unapproved deviations from the degree plan may result in no credit toward degree requirements.

The Thesis Proposal must be presented during the first semester the student is registered in BMEN 5950. Consult with Major Professor.

<b>Block A - BMEN Core Courses - 6 Semester Credit Hours</b>	<b>Semester expected to Complete</b>	<b>Grade</b>	<b>sch</b>
• BMEN 5210 – Biomedical Engineering Laboratory			2
• BMEN 5315 – Computational Methods in Biomedical Engineering			3
• BMEN 5940 – Biomedical Engineering Seminar			1
<b>Block B - BMEN Courses - 9 Semester Credit Hours</b>	<b>Semester expected to Complete</b>	<b>Grade</b>	<b>sch</b>
BMEN 5005 – Neuroengineering			
BMEN 5007 – Research Methods in Biomedical Engineering			
BMEN 5280 – AI for Wearables and Healthcare			
BMEN 5310 – Clinical Instrumentation			
BMEN 5311 – Rehabilitation Engineering			
BMEN 5312 – Advanced Signal Processing in Biomedical Engineering			
BMEN 5313 – Bioengineering of Cellular Systems			
BMEN 5314 – Advanced Tissue Engineering and Regenerative medicine			
BMEN 5316 – Biopolymers and Flexible bio-electronics			
BMEN 5317 – Advanced Biotechnology			
BMEN 5318 – Biomedical Implants			
BMEN 5319 – Cardiovascular Fluid Dynamics			
BMEN 5320 – Advanced Biomechanics			
BMEN 5321 – Biomaterials Compatibility			
BMEN 5322 – Medical Imaging			
BMEN 5323 – Advanced Biomedical Optics			
BMEN 5324 – Biomedical MEMS			
BMEN 5325 – Bio-nanotechnology			
BMEN 5326 – Biomolecular Engineering			
BMEN 5700 – Statistical Genetics			
BMEN 5800 – Topics in Biomedical Engineering			
BMEN 5810 – Topics in Biomedical Engineering			
BMEN 5890 – Directed Study in Biomedical Engineering			
BMEN 5900 – Special Problems in Biomedical Engineering			
BMEN 5910 – Special Problems in Biomedical Engineering			
BMEN 5920 – Cooperative Education in Biomedical Engineering			
<b>Block C – Thesis, 6 Semester Credit Hours</b>			
BMEN 5950 – Master’s Thesis			
<b>Block D – Electives, 9 Hours</b>	<b>Semester expected to Complete</b>	<b>Grade</b>	<b>sch</b>
5000 or 6000 level courses from any of BMEN, EENG, MEEN, MTSE, CSCE, or BIOL 5000 level or above MGMT/LSCM/MKTG courses from the College of Business 5000 level or above HLSV courses from the College of Health and Public Service 5000 level or above MUPH courses in Performance Arts Health from the College of Music 6000 level or above ASLP courses in Audiology from the College of Health and Public Service			

**Non-thesis Option:**

Course offerings vary from year to year and are based on enrollment and resources. The Graduate Program Committee Representative and the student are advised to tailor the degree plan based on course availability.

Courses registered without Advisor’s approval or any unapproved deviations from the degree plan may result in no credit toward degree requirements.

<b>Block A - BMEN Core Courses - 6 Semester Credit Hours</b>	<b>Semester expected to Complete</b>	<b>Grade</b>	<b>sch</b>
• BMEN 5210 – Biomedical Engineering Laboratory			2
• BMEN 5315 – Computational Methods in Biomedical Engineering			3
• BMEN 5940 – Biomedical Engineering Seminar			1
<b>Block B - BMEN Courses - 18 Semester Credit Hours</b>	<b>Semester expected to Complete</b>	<b>Grade</b>	<b>sch</b>
BMEN 5005 – Neuroengineering			
BMEN 5007 – Research Methods in Biomedical Engineering			
BMEN 5280 – AI for Wearables and Healthcare			
BMEN 5310 – Clinical Instrumentation			
BMEN 5311 – Rehabilitation Engineering			
BMEN 5312 – Advanced Signal Processing in Biomedical Engineering			
BMEN 5313 – Bioengineering of Cellular Systems			
BMEN 5314 – Advanced Tissue Engineering and Regenerative medicine			
BMEN 5316 – Biopolymers and Flexible Bio-electronics			
BMEN 5317 – Advanced Biotechnology			
BMEN 5318 – Biomedical Implants			
BMEN 5319 – Cardiovascular Fluid Dynamics			
BMEN 5320 – Advanced Biomechanics			
BMEN 5321 – Biomaterials Compatibility			
BMEN 5322 – Medical Imaging			
BMEN 5323 – Advanced Biomedical Optics			
BMEN 5324 – Biomedical MEMS			
BMEN 5325 – Bio-nanotechnology			
BMEN 5326 – Biomolecular Engineering			
BMEN 5700 – Statistical Genetics			
BMEN 5800 – Topics in Biomedical Engineering			
BMEN 5810 – Topics in Biomedical Engineering			
BMEN 5890 – Directed Study in Biomedical Engineering			
BMEN 5900 – Special Problems in Biomedical Engineering			
BMEN 5910 – Special Problems in Biomedical Engineering			
BMEN 5920 – Cooperative Education in Biomedical Engineering			
<b>Block C – Electives - 9 Semester Credit Hours</b>	<b>Semester expected to Complete</b>	<b>Grade</b>	<b>sch</b>
5000 or 6000 level courses from any of BMEN, EENG, MEEN, MTSE, CSCE, or BIOL 5000 level or above MGMT/LSCM/MKTG courses from the College of Business 5000 level or above HLSV courses from the College of Health and Public Service 5000 level or above MUPH courses in Performance Arts Health from the College of Music 6000 level or above ASLP courses in Audiology from the College of Health and Public Service			

### 3. Admission procedures

Fall applicants: We begin awarding assistantship funding on January 15th each year. To be considered for all funding opportunities, submit all required application materials by January 15th. Application priority dates are set by the Toulouse Graduate School.

Priority Dates – Your application must be submitted in ApplyTexas by the dates listed below. If you wish to be considered for financial assistance, it is imperative that you meet the priority dates.

International student priority dates:

Fall, June 15th

Spring, October 15th

Summer, January 1st

Domestic student priority dates:

Fall, June 15th

Spring, October 15th

Summer, April 15th

MS in Biomedical Engineering

Application Requirements for a MS in Biomedical Engineering

GRE scores (official)

TOEFL score (for international students only, official) or IELTS

Transcripts (official)

Previous research or work experience (if applicable)

TOULOUSE GRADUATE SCHOOL APPLY ONLINE

Leveling Courses for Non-Biomedical Engineering Applicants

Leveling courses will be required for applicants with undergraduate degrees other than Biomedical Engineering. The leveling courses include:

Mathematics through multivariable calculus

Physics including mechanics, electricity and magnetism

Chemistry

BMEN 2320, Biomedical Instrumentation

BMEN 2330, Biomedical Transport Phenomena

BMEN 3310, Human Systems

BMEN 3312, Introduction to Biomechanics or BMEN 3321, Biomaterials

Ph.D. in Biomedical Engineering

Minimum Requirements for Admission

All students applying for graduate study must have completed a 4-year bachelor's degree, and submit the following:

Graduate Record Examination (GRE) scores;

Official transcripts from each college or university attended, should be sent to:

UNT Graduate School

1155 Union Circle #310440

Denton, Texas 76203-5017

Three letters of recommendation from professors or employers; (may be sent directly to Stephanie.Deacon@unt.edu).

A personal statement that highlights aspects of the applicant's background and his or her career plans; (may be sent directly to Stephanie.Deacon@unt.edu).

Most current Resume

An acceptable score on either the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS) for applicants whose native language is not English. It is the student's responsibility to have official scores sent from ETS to the University of North Texas. (We do not accept the "My Best" scores. You will need to order the official TOEFL score report via ETS).

#### 4. Transfer credit policies and procedures

PhD students with a MS degree may transfer a maximum of 10 credit hours.

#### 5. Selection of major professor and advisory committee

Before you register thesis hours, talk to your Major Professor about your ideas for Committee Members. Then go to each professor and describe the ideas you have for your thesis and ask if they would like to be on your committee. Your Major Professor and both of your Committee Members need to be appointed before you register for your first BMEN 5950 Thesis course (approximately 2 semesters in advance to your defense). There is a requirement that 2 of your Committee Members must be from BMEN Dept. However, if you wish to have a professor from another department, this is fine as well for you may have more than 2 Committee Members on your committee.

#### 6. Satisfactory progress

MS students are required to maintain an average GPA of 3.0. PhD students should discuss regularly with their advisors about their progress.

#### 7 Plan/guidelines for students to successfully exit the program(s)

- After your defense is complete, you will need to make any and all edits recommended by your Committee.
- The Texas Digital Library has created a short instruction video, which you may find helpful to view prior to logging in. <https://library.unt.edu/digital-libraries/texas-digital-library/>
- Please review the instructions for submission: <http://tgs.unt.edu/new-current-students/theses-and-dissertations>, and <http://tgs.unt.edu/sites/default/files/ETD%20Submission%20-%20Vireo.pdf> .
- Frequently Asked Questions, Graduate School Website, for Thesis and Dissertation questions, <https://tgs.unt.edu/frequently-asked-questions#panel116>
- If you have questions about formatting your thesis or dissertation, you may contact the Graduate Reader directly (Jill.Kleister@unt.edu)
- Now you are ready to submit your thesis to TGS online through Vireo at <https://unt-etd.tdl.org/>
- After you have submitted your thesis through Vireo, your major professor will receive an email from the Vireo system; the response and approval of the student's submission is required before the Graduate Reader can begin her review of submitted documents, and before the student can be reviewed for graduation approval.
- Interested in having your thesis bound? While the Graduate School only accepts electronic versions, if you wish to bind your thesis or dissertation in a soft cover binding,

you can bring your final approved PDF to any copy business (e.g., FedEx Office) and have them bind it. For hardcover binding options, please contact the Graduate Reader.

#### 8. Qualifying/comprehensive exam(s)

##### Qualifying Examination Committee

In order to advance to PhD candidacy, the student need to take a qualifying examination. A Qualifying Examination Committee (QEC) shall be appointed by the student to administer the PhD Qualifying Examination (QE). The Respective form must be filled and signed by all committee members and submitted by the student to Anna Phelan/Jaimie Tesdahl at least one month prior to the examination.

The student shall appoint a QEC of one Chair and three additional members. The composition of this committee shall meet the following minimum criteria:

1. The Chair and two additional member must hold a primary faculty appointment in the Department of Biomedical Engineering at UNT.
2. The student's Research Advisor must be a member of this committee, but shall not be the chair. If a student is co-advised, at least one of the advisors must be part of the committee.

The duties of the Qualifying Examination Committee include:

1. Review the academic record of the candidate.
2. Review the student's Qualifying Examination Application.
3. Advise the student on preparation for the Qualifying Examination.
4. Conduct the examination. The student passes the Qualifying Examination if at least two of the three committee members vote approval.

##### PhD Qualifying Examination

The qualifying exam consists of a single oral exam conducted by the student's QE Committee. In the exam, the student will present his/her doctoral research proposal to the Committee and respond to their questions and comments. The student should allow approximately 1 hour for the exam – 20 minutes for his/her presentation and 30-40 minutes for questions from the Committee. In the course of the exam, the Committee will question the student about the content and plan of the proposal, as well as general didactic knowledge in the engineering and biology areas relevant to the proposed research.

The student must meet with their entire Committee, either as a group or individually, at least one time prior to taking the exam and all members must sign the QE Committee Form. This form needs to be returned to Anna Phelan/ Jaimie Tesdahl no later than one month prior to the date of the exam.

A written proposal must be submitted to the Committee at least two weeks prior to the exam. This proposal must be in the general form of an NIH F31 proposal (6-page research plan and specific aims page). The proposed research project can be either hypothesis driven or design driven, without prejudice. Hypothesis-driven plans must include specific testable hypotheses. Design-driven plans must have well-defined outcome measures and success criteria. It is expected that the student, research advisor and the Committee go through several iterations of the proposal and that the student discuss the proposal with each Committee member prior to taking the exam. The student must email a copy of their proposal to Anna Phelan/ Jaimie Tesdahl at least one week prior to the date of the exam.

##### Eligibility

The student must have a research advisor and be working in a relevant laboratory and completed elective BMEN course requirements. The student's research advisor must commit to be willing to support the student during his/her doctoral work. The student must form his/her QE Committee and complete the initial exam prior to the finishing their fourth semester (only counting Spring and Fall semesters).

Evaluation.

The successful student will:

1. Demonstrate an advanced, state-of-the-art level of competence in a selected area of research
2. Demonstrate core competence in biomedical engineering
3. Scientifically defend their proposed experimental rationale
4. Relate their proposed project to the broader aspects of the chosen field

The Committee decides the student's advancement to candidacy based on both the written proposal and the oral exam. The Committee is expected to maintain a high standard for evaluating the written proposal in terms of both content (knowledge in engineering/scientific areas), and the plan itself. It is also expected to evaluate deficiencies in the student's background (e.g., poor grade in a course or lack of coursework in an area vital to the student's area of research).

The Committee's recommendation for candidacy must be unanimous and unconditional. Any agreements must be fulfilled by the student and approved by the Committee prior to recommendation for advancement to candidacy. The Committee is expected to work to reach a consensus among its members.

The Committee may take the following actions as a result of the outcome of the exam:

1. Recommend the student be advanced to candidacy without further conditions.
2. Recommend the student be advanced to candidacy conditionally – i.e. the student will not be advanced to candidacy until completion of:
  - a. change in the focus or scope of the proposal.
  - b. re-write of all or part of the proposal.
  - c. the student takes extra course(s).
  - d. the student takes additional preliminary data, or re-analyzes existing data.
  - e. any other action that the Committee feels is in the best interests of the student.
3. Fail with an opportunity to retake within 6 months - The QEC determined that the candidate had several weaknesses. However, the majority of the QEC determined that the student has the potential to be a successful PhD candidate and could address the weaknesses. In this case, the student will have an opportunity to repeat the exam which must be accomplished with 6 months of the original exam. The second exam only has 2 possible outcomes; unconditional pass, or fail without opportunity to retake the exam. The research advisor may elect to suspend funding pending successful completion of the QE by the student.

After the exam, the Chair of the QE will email the QE Evaluation Form, which has been approved by all Committee members, to Anna Phelan/ Jaimie Tesdahl and she will then forward a copy to the student. The form will include:

1. Brief summary of the student's academic and research performance to be filled in by the student's research advisor.
2. Brief summary of the student's performance at the exam and recommendation to the student to be filled in by the Chair of the QE.

3. Decision of the Committee to be filled in by the Chair of the QE.