# Doctor of Philosophy in Biomedical Engineering

## About This Program

The Doctor of Philosophy in Biomedical Engineering is jointly offered by The University of Texas at Arlington and The University of Texas Southwestern Medical Center at Dallas (UT Southwestern). Research and teaching efforts of various departments in the biological, engineering, mathematical, physical, and medical sciences of both institutions are coordinated through the Committee on Graduate Studies in Biomedical Engineering. The goal of the program is to prepare students for bioengineering careers requiring skills in research, development, and teaching in a variety of settings in industry, in hospitals, in research facilities of educational and medical institutions and in government regulatory agencies. Internships are aimed to further prepare students for careers in the bioengineering industry.

The program includes coursework and research in medical imaging, biosensors, physiological control systems, biomedical signal processing, biomedical instrumentation, rehabilitation, orthopedics, biomechanics, biomaterials and tissue engineering and neurosciences. Specifically, during the first year of their studies, students in the master's and doctoral programs must select one of the concentration tracks in bioengineering:

1. Medical Imaging
2. Bioinstrumentation
3. Biomaterials/Tissue Engineering
4. Biomechanics/Medical Implant Devices
5. Nanomedicine/Nanoengineering - Drug Delivery
6. Computational Bioengineering

A track advisor is available to advise students on the relevant courses and the research opportunities in each track.

The doctoral program is based upon graduate level work in bioengineering, and extensive graduate training in the life sciences and related physical sciences. The program is aimed at the development of professional biomedical engineers capable of independent research.

Bioengineers use quantitative methods and innovation to analyze and to solve problems in biology and medicine. Students choose the Bioengineering field to serve people, to partake in the challenge and excitement of working with living systems, and to apply advanced technology to complex problems of medical care. Through this program, students learn the essentials of life science, engineering theory, and the analytical and practical tools that enable them to be successful in the biotechnology and bioengineering industries. The program includes coursework in the basic sciences, core engineering, bioengineering, and advanced biotechnology disciplines. Both didactic classroom lectures and hands-on laboratory experience are emphasized. Additionally, students are required to take general educational courses in literature, fine arts, history, political science, and social science.

## Competencies

1. Upon completion, students will be able to present research work in writing, including mechanics and wording as well as the clarity and organization of written work.
2. Upon completion, students will be able to present research work orally and visually, including the delivery as well as the clarity and organization of the presentation.
3. Upon completion, students will be able to design and to conduct research in specialty areas, including experiments supporting the research topics and effectiveness in the ability to analyze, interpret the results.
4. Upon completion, students will demonstrate knowledge of bioengineering principles, including understanding the concepts from life sciences and understanding the concepts from engineering.

# Admissions Criteria

Although qualified applicants may be accepted into the PhD program without earning the Master of Science in Biomedical Engineering, all students must satisfactorily pass BE 6194 DOCTORAL DIAGNOSTIC EXAMINATION. This examination will cover all relevant coursework taken by the student. The examination may be written, oral, or both and consists of a timed, written analysis of a major problem in the student's general area of research interest, followed by an oral examination covering the same material. Elements of engineering, physical and biological science, mathematics, computer science and statistics may be included in this examination.

In addition to the general graduate admission requirements (https://catalog.uta.edu/academicregulations/admissions/graduate/), the bachelor's degree held by applicants to the program may be in engineering, biological, physical, or mathematical sciences. Depending on the applicant's background, some preparatory coursework may be required, prior to admission into the program.  The UT Arlington Biomedical Engineering program uses the following guidelines in the admission review process:

## UNCONDITIONAL ADMISSION

1. Minimum GPA of 3.4 in the last 60 hours taken in the major field of study of engineering or physical sciences as calculated by the Graduate School.
2. GRE Total (quantitative plus verbal) must be greater than 308 with a verbal score of 146 or better.
3. Three favorable letters of recommendation.
4. A total TOEFL score of 79 or better for Internet-based testing for international applicants whose native language is not English.

## PROBATIONARY ADMISSION

1. If an applicant meets the criteria for either the GPA or the GRE, but does not meet the minimum criteria for the other, a probationary admission can be granted. The probationary status can only be removed by maintaining a 3.0 GPA derived from UTA/BE courses for two successive semesters.
2. A total TOEFL score of 79 or better for Internet-based testing for international applicants whose native language is not English.

## PROVISIONAL ADMISSION

An applicant who is unable to supply an official transcript may be granted provisional admission by supplying unofficial transcript for admission purposes. An official transcript must be received by the start of the first semester of admission.

## DEFERRED ADMISSION

If an applicant does not present adequate evidence of meeting admission requirements, the admission decision may be deferred until admission records are complete or the requirements are met.

## DENIAL OF ADMISSION

A candidate may be denied admission if he/she has less than satisfactory records in any of the admission criteria, excluding TOEFL.

# Curriculum

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| **Bioengineering Foundations** | | |
| PhD Seminar for at least three semesters: | | 3 |
| BE 6101 | PhD SEMINAR IN BIOENGINEERING | |
| BE 6102 | PhD SEMINAR IN BIOENGINEERING | |
| BE 6103 | PhD SEMINAR IN BIOENGINEERING | |
| Life Sciences | | 3 |
| BE 5309 | HUMAN PHYSIOLOGY IN BIOENGINEERING | |
| For Laboratory, select one from the following: | | 3 |
| BE 5324 | BIOMEDICAL OPTICS LABORATORY | |
| BE 5373 | FORMULATION AND CHARACTERIZATION OF DRUG DELIVERY SYSTEMS | |
| BE 5318 | MEDICAL DEVICE PROTOTYPING | |
| BE 5382 | LABORATORY PRINCIPLES | |
| **Bioengineering Electives** | | |
| Select five of the following: | | 15 |
| BE 5300 | SELECTED TOPICS IN BIOENGINEERING | |
| BE 5310 | BIOMECHANICS AND FLUID FLOW WITH COMPUTATIONAL LAB | |
| BE 5312 | TISSUE BIOMECHANICS AND BIOENGINEERING | |
| BE 5314 | BIOMEDICAL IMPLANTS | |
| BE 5315 | FUNDAMENTALS OF BIOMOLECULAR ENGINEERING | |
| BE 5324 | BIOMEDICAL OPTICS LABORATORY | |
| BE 5325 | FLUORESCENCE MICROSCOPY | |
| BE 5326 | TISSUE ULTRASOUND OPTICAL IMAGING | |
| BE 5327 | TISSUE OPTICS | |
| BE 5329 | NEURAL ENGINEERING | |
| BE 5331 | POLYMERS AND BIOCOMPATIBILITY | |
| BE 5333 | NANO BIOMATERIALS AND LIVING-SYSTEMS INTERACTIONS | |
| BE 5337 | TRANSPORT PHENOMENA IN BIOMEDICAL ENGINEERING | |
| BE 5343 | IMAGE PROCESSING WITH MATLAB: APPLICATIONS IN MEDICINE AND BIOLOGY | |
| BE 5344 | BIOINSTRUMENTATION I | |
| BE 5346 | MEDICAL IMAGING | |

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| BE 5347 | PRINCIPLES OF FUNCTIONAL MAGNETIC RESONANCE IMAGING | |
| BE 5352 | DIGITAL PROCESSING OF BIOLOGICAL SIGNALS | |
| BE 5361 | BIOMATERIALS AND BLOOD COMPATIBILITY | |
| BE 5364 | TISSUE ENGINEERING | |
| BE 5366 | PROCESS CONTROL IN BIOTECHNOLOGY | |
| BE 5370 | BIOMATERIAL - LIVING SYSTEMS INTERACTION | |
| BE 5372 | DRUG DELIVERY SYSTEM | |
| BE 5373 | FORMULATION AND CHARACTERIZATION OF DRUG DELIVERY SYSTEMS | |
| BE 5382 | LABORATORY PRINCIPLES | |
| BE 5385 | STEM CELL TISSUE ENGINEERING | |
| BE 5388 | MEDICAL PRODUCT DESIGN AND DEVELOPMENT | |
| Other course approved by the Graduate Advisor | | |
| **Additional Engineering/Life Sciences** | | |
| Select 3 hours from another engineering department or life sciences with the approval of the Graduate Advisor | | 3 |
| Select 3 hours from one of the following areas: | | 3 |
| Cell Physiology | | |
| Neuroscience | | |
| Tumor Physiology | | |
| Select 3 hours from one of the following areas: | | 3 |
| Biochemistry | | |
| Molecular Biology | | |
| Immunology | | |
| **Mathematics, Statistics, Computer and Physical Sciences** | | |
| Select 3 hours in biostatistics with the approval of the Graduate Advisor | | 3 |
| **PhD Examinations and Dissertation** | | |
| All students must complete the following in order, leading to BE 6999 in the semester in which the student expects to submit and defend the dissertation: | | |
| BE 6194 | DOCTORAL DIAGNOSTIC EXAMINATION | 1 |
| BE 6195 | DOCTORAL COMPREHENSIVE EXAMINATION | 1 |
| BE 6999 | DISSERTATION | 9 |
| **Total Hours** | | **47** |

For completion of doctoral degree, a minimum of 38 semester hours of graduate coursework is expected for students entering with an appropriate master's degree, or a minimum of 47 semester hours of graduate coursework is expected for student's entering with a bachelor's degree, as approved by the Committee on Graduate Studies. Additional coursework may be required by the student's doctoral dissertation committee. Students are required to take research hours every semester to remain enrolled in the program while progressing from coursework to candidacy, to dissertation defense.

## Program Completion

The Biomedical Engineering Graduate Program has established certain policies to fulfill its responsibility to graduate highly qualified professional engineers. In addition to the requirements of the Graduate School listed in this catalog under Advanced Degrees and Requirements, each bioengineering graduate student who wants to continue in the program must:

1. Maintain at least an overall GPA of 3.0 from all coursework and satisfactory progress in graduate studies, including seminar attendance and participation.
2. Demonstrate suitability for professional engineering practice.

At such time as questions are raised by bioengineering graduate faculty regarding either of the above, the student will be notified and will be provided the opportunity to respond to the Committee on Graduate Studies in Bioengineering. The Committee on Graduate Studies will review the student's performance and make a recommendation concerning the student's eligibility to continue in the program. Appeal of a decision on continuation may be made through normal procedures outlined in the section of this catalog entitled "Grievances Other than Grades."

## Advising Resources

First semester graduate students will be required to complete on online orientation prior to enrolling for classes.  This online orientation will be sent to new students approximately one month prior to the start of the semester.  All graduate students will also be required to attend an in-person orientation scheduled for approximately one week prior to the start of classes.  Please see our website for the actual date of the orientation.

## Location:

ERB 232

## Email:

BE@uta.edu

## Phone:

817-272-0783

## Web:

To schedule an appointment (https://www.uta.edu/academics/schools-colleges/engineering/academics/departments/bioengineering/students/)