

Bachelor of Science in Biomedical Engineering

About This Program

The Bachelor of Science in Biomedical Engineering (BS BME) prepares students for bioengineering careers requiring research, development, and teaching skills in a variety of industry settings including hospitals, research facilities of educational and medical institutions, and government regulatory agencies. Graduates may also pursue their continuing education in the medical and dental field or graduate studies in bioengineering.

BS BME degree offers two areas for concentration: Tissue Engineering and Medical Imaging.

Descriptions of BE degree options are available in the BE Advising Office. All degree options are designed to provide a strong foundation in science, mathematics, and engineering science; technical competence in multiple areas of Bioengineering practice; and an understanding of the importance of ethics, safety, professionalism, and socioeconomic concerns in resolving technical problems through synthesis, planning, and design. Elements of design are introduced at the freshman level. This is followed by an analysis and design component in professional program courses, culminating in a comprehensive design experience.

The Department of Bioengineering has active student chapters associated with the Biomedical Engineering Student Society (BMESS). Students are encouraged to participate in the activities of the organization. Membership is by election and is limited to UTA students who satisfy other requirements listed in the society's bylaws.

ABET ACCREDITATION

The program is accredited by the Engineering Accreditation Commission of ABET, (<https://www.abet.org>) under the commission's General Criteria and the Program Criteria for Biomedical Engineering.

PROGRAM EDUCATIONAL OBJECTIVES

The programs is designed so that a few years following graduation students will be able to:

- Possess a broad-based bioengineering education to successfully obtain professional positions, and practice bioengineering in a wide range of professional settings including industries, healthcare facilities, and consulting firms.
- Exhibit professional growth throughout their careers by taking on increasing professional responsibilities, and pursue life-long learning by participation in job-related advanced training activities, and/or attending graduate school, or professional school (medical or dental school).
- Demonstrate success and leadership in practice of engineering by contributing to the economic well-being of their employers and society, and by dedicated service to professional societies.

STUDENT OUTCOMES

Upon completion of the degree, students will be able to:

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. 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
3. Communicate effectively with a range of audiences.
4. 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.
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

Admissions Criteria

Requirements for admission as a Biomedical Engineering major are governed by the requirements stated under the College of Engineering section of this catalog. Biomedical Engineering majors are only allowed to enroll in pre-professional courses until they meet the requirements for the professional program as outlined below. They must register only for courses approved by their faculty advisor and obtain their advisor's authorization for add/drops.

UNDERGRADUATE ADVISING

Students entering directly from high school and those with less than 24 hours of transferrable credit are advised initially in the University College. Students are transitioned to advising in the College of Engineering as they progress successfully in their degree programs.

Biomedical Engineering majors are required to be advised by an assigned advisor during the period set aside each semester by the College of Engineering for this purpose. Students are responsible for meeting with their advisors during the advising period. Periods set aside for advising

and registration may be different, and students who do not meet with their advisors during the regular advising period may not be able to complete registration. All students should consult the departmental bulletin board for advisors' names and periods set aside for advising.

Biomedical Engineering students who have not been admitted to the professional program must register only for courses approved by their faculty advisor and obtain their advisor's authorization for add/drops. Failure to do so is grounds for dismissal from the Biomedical Engineering program. Students, including those in the professional program, who enroll in courses before taking the proper prerequisites or co-requisites, will be subject to dismissal from the Biomedical Engineering program.

Transfer students registering for the first time are advised separately prior to the beginning of the semester they enroll in courses. They should contact the department to set up an appointment for advising with a departmental undergraduate advisor prior to registration.

ADMISSION TO THE PROFESSIONAL PROGRAM

Requirement for admission to the professional program in Biomedical Engineering are in accordance with those of the College of Engineering and additional requirements as follows.

- Application to the professional program is to be submitted to the BE Department after completion of all the pre-professional required courses and prior to taking any Bioengineering 3000 level course.
- No 3000 level Bioengineering course may be taken until the student is admitted into the professional program or obtains the written consent for the BE Department Chair.
- Each student must have a total of no more than four unsuccessful attempts in engineering courses and complete all the courses in the pre-professional required courses with a minimum grade of C in each course and a minimum GPA of 2.50
 - a. in all courses,
 - b. in math, science, and engineering courses.
 - c. in bioengineering courses
- Upon receipt of the application, a student's record is individually reviewed including grades, academic and personal integrity, record of drops and course withdrawals, the order in which courses have been taken, the number of times a student has attempted a course for credit, and any other aspect of the student's record that may be deemed pertinent to admission.

The student must be admitted to the professional program and have an approved degree plan on file in order to graduate. The degree plan is generated upon entry to the professional program. Graduating seniors should apply to graduate during the next-to-last semester.

PRIOR PREPARATION AND COURSE REQUIREMENTS

The undergraduate baccalaureate degree in Biomedical Engineering is a four-year program and requirements for the degree are based upon prior high school preparation through either an honors or college track program. Students who have not had the appropriate prior preparation should contact the departmental advising office for a curriculum guide that will assist them in structuring a study plan that will include leveling courses. Students requiring leveling courses may require a period of time greater than four years to complete their undergraduate degree.

TRANSFER STUDENTS AND TRANSFER CREDIT

When a student transfers to the Bioengineering Department from another department or institution or vice versa, a loss of credit can occur and his/her academic plans may have to be changed. Courses that appear to be similar may be different in either content or level of difficulty and, as a result, cannot be used for degree credit. For transferred courses that cannot be deemed equivalent to a required UTA course in content or in credit hours, students will be required to submit acceptable scores from CLEP, ASE for Undergraduate Advisor's approval. When a student's record indicates weakness in certain areas of study, he/she will be required to retake courses or to take additional courses. Transfer students should contact the Department of Bioengineering after admission and prior to registration.

Transfer students with 24 hours or more of transferable credit must meet the following requirements:

- Completed prerequisites necessary to enroll in MATH 1426 CALCULUS I and PHYS 1443 GENERAL TECHNICAL PHYSICS I
- Students for whom English is a primary language must present two high school units in a single foreign language or will be admitted with a foreign language deficiency that must be removed prior to graduation.
- A GPA of 3.0 or above calculated on transferred credits which include at least 15 hours of applicable math, science, and engineering courses.
- Students must be prepared to repeat any transferred courses below a C until a grade of C or higher is obtained prior to enrolling in any course for which such courses are prerequisite. To transfer bioengineering course credits, the limitation on the number of times a course can be repeated is three.

Students who do not meet these criteria will be reviewed and considered on individual merits for admission into the BE Intended (or Pre) Major.

Prior to advising, a transfer student should present to an undergraduate advisor a transcript (official or copy) from each school previously attended. Only the equivalent courses in a program accredited by ABET or equivalent freshman and sophomore courses accepted by the department can be counted toward a degree in Biomedical Engineering. To be acceptable as an equivalent course, it must be equivalent to our corresponding course in credit value

and course content. Junior and senior level courses taken at a college or university which does not have a Bioengineering program accredited by ABET cannot be used to satisfy the requirements for a degree in Biomedical Engineering.

A student in the Department of Bioengineering at UT Arlington who wishes to enroll in courses at another college or university for transfer credit toward a degree in Biomedical Engineering should, first, consult with an undergraduate advisor to verify that the course credits can be used in the student's Biomedical Engineering degree plan.

Curriculum

Foundations

General Core Requirements (<https://catalog.uta.edu/academicregulations/degree/requirements/generalcore/requirements/>) 42

Students must complete specific courses within certain core areas.

In addition to the specified courses, students must choose 6 hours of U.S. History, 6 hours of Political Science, 3 hours of Language, Philosophy, Culture, and 3 hours of Creative Arts from the general education core.

For Communication select:

ENGL 1301	RHETORIC AND COMPOSITION I
COMS 2302	PROFESSIONAL AND TECHNICAL COMMUNICATION FOR SCIENCE AND ENGINEERING

For Mathematics select:

MATH 1426	CALCULUS I
MATH 2425	CALCULUS II

For Life & Physical Science select:

BIOL 1441	BIOLOGY I FOR SCIENCE MAJORS: CELL AND MOLECULAR BIOLOGY
PHYS 1443	GENERAL TECHNICAL PHYSICS I

For Language, Philosophy & Culture select:

PHIL 1304	CONTEMPORARY MORAL PROBLEMS
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For Foundational Component Area option select:

CHEM 1441	GENERAL CHEMISTRY I
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Biomedical Engineering Foundations (Pre-Professional Program)

Additional hours required in core selections 5

UNIV-EN 1131	STUDENT SUCCESS	1
or ENGR 1101	ENTRANCE TO ENGINEERING FOR TRANSFER STUDENTS	
BE 1105	MEDICAL APPLICATIONS OF ENGINEERING ¹	1
BE 1325	INTRODUCTION TO BIOENGINEERING ¹	3
BE 2315	INTRODUCTORY COMPUTATIONAL TOOLS FOR BIOENGINEERS	3
BE 3320	BIOMEDICAL SIGNAL ACQUISITION AND ANALYSIS	3
CHEM 1442	GENERAL CHEMISTRY II	4
MATH 2326	CALCULUS III	3
MATH 3319	DIFFERENTIAL EQUATIONS & LINEAR ALGEBRA	3
IE 3301	ENGINEERING PROBABILITY	3
or MATH 3316	STATISTICAL INFERENCE	
PHYS 1444	GENERAL TECHNICAL PHYSICS II	4
CSE 2440	CIRCUIT ANALYSIS	4
or EE 2440	CIRCUIT ANALYSIS WITH LAB	

Biomedical Engineering Specialization (Professional Program)

BE 3301	CELL PHYSIOLOGY FOR BIOENGINEERS	3
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Choose one of the following options: 2

BE 3280	INTRODUCTION TO MEDICAL DEVICE REGULATORY REQUIREMENTS & QUALITY STANDARDS	
BE 3101 & BE 3191	SEMINAR IN BIOENGINEERING and DIRECTED RESEARCH IN BIOENGINEERING	
BE 3317	LINEAR SYSTEMS IN BIOENGINEERING	3
BE 3380	HUMAN PHYSIOLOGY IN BE	3
BE 4350	SENIOR DESIGN PROJECT I	3
BE 3415	FUNDAMENTALS OF BIOMOLECULAR ENGINEERING	4
BE 4355	SENIOR DESIGN PROJECT II	3
BE 4382	LABORATORY PRINCIPLES	3
Concentrations		
Select one of the following concentrations:		24
Tissue Engineering		
BE 3310	BIOMECHANICS AND FLUID FLOW WITH COMPUTATIONAL LABORATORY	
or BE 4312	TISSUE BIOMECHANICS AND BIOENGINEERING	
BE 3367	CELL CULTURE AND BIOMATERIAL LABORATORY	
or BE 4318	MEDICAL DEVICE PROTOTYPING	
or BE 4373	FORMULATION AND CHARACTERIZATION OF DRUG DELIVERY SYSTEMS	
BE 4337	TRANSPORT PHENOMENA IN BIOMEDICAL ENGINEERING	
or BE 4314	BIOMEDICAL IMPLANTS	
BE 4368	AN INTRODUCTION TO TISSUE ENGINEERING AND REGENERATIVE MEDICINE	
or BE 4364	TISSUE ENGINEERING	
or BE 4372	DRUG DELIVERY SYSTEM	
BE 4331	BIOPOLYMERS AND BIOCOMPATIBILITY	
or BE 4333	NANO BIOMATERIALS AND LIVING-SYSTEMS INTERACTION	
Tissue Engineering Technical Electives		
Select 3 from the following in consultation with BE advisor:		
BE 2310	ENGINEERING APPROACHES TO SOLVING CLINICAL CHALLENGES	
BE 3325	FLUORESCENCE MICROSCOPY	
BE 3327	TISSUE OPTICS	
BE 3343	MATLAB AND APPLICATIONS FOR BIOENGINEERS	
BE 3344	BIOINSTRUMENTATION	
BE 3346	MEDICAL IMAGING	
BE 3352	DIGITAL PROCESSING OF BIOLOGICAL SIGNALS	
BE 4300	SPECIAL TOPICS IN BIOENGINEERING	
BE 4312	TISSUE BIOMECHANICS AND BIOENGINEERING	
BE 4314	BIOMEDICAL IMPLANTS	
BE 4318	MEDICAL DEVICE PROTOTYPING	
BE 4324	BIOMEDICAL OPTICS LABORATORY	
BE 4326	TISSUE ULTRASOUND-OPTICAL IMAGING	
BE 4329	NEURAL ENGINEERING	
BE 4364	TISSUE ENGINEERING	
BE 4366	PROCESS CONTROL IN BIOTECHNOLOGY	

BE 4368	AN INTRODUCTION TO TISSUE ENGINEERING AND REGENERATIVE MEDICINE
BE 4372	DRUG DELIVERY SYSTEM
BE 4373	FORMULATION AND CHARACTERIZATION OF DRUG DELIVERY SYSTEMS (when topic is relevant)
BE 4385	STEM CELL TISSUE ENGINEERING
BE 4388	MEDICAL PRODUCT DESIGN AND DEVELOPMENT
BIOL 3315	GENETICS
Another course approved by advisor	
Medical Imaging	
BE 3344	BIOINSTRUMENTATION
BE 3346	MEDICAL IMAGING
BE 3352	DIGITAL PROCESSING OF BIOLOGICAL SIGNALS
BE 4324	BIOMEDICAL OPTICS LABORATORY
Medical Imaging Technical Electives	
Select 4 of the following in consultation with BE advisor:	
BE 2310	ENGINEERING APPROACHES TO SOLVING CLINICAL CHALLENGES
BE 3310	BIOMECHANICS AND FLUID FLOW WITH COMPUTATIONAL LABORATORY
BE 3325	FLUORESCENCE MICROSCOPY
BE 3327	TISSUE OPTICS
BE 3343	MATLAB AND APPLICATIONS FOR BIOENGINEERS
BE 3367	CELL CULTURE AND BIOMATERIAL LABORATORY
BE 4312	TISSUE BIOMECHANICS AND BIOENGINEERING
BE 4318	MEDICAL DEVICE PROTOTYPING
BE 4314	BIOMEDICAL IMPLANTS
BE 4326	TISSUE ULTRASOUND-OPTICAL IMAGING
BE 4300	SPECIAL TOPICS IN BIOENGINEERING (when topic is relevant)
BE 4329	NEURAL ENGINEERING
BE 4331	BIOPOLYMERS AND BIOCOMPATIBILITY
BE 4333	NANO BIOMATERIALS AND LIVING-SYSTEMS INTERACTION
BE 4337	TRANSPORT PHENOMENA IN BIOMEDICAL ENGINEERING
BE 4364	TISSUE ENGINEERING
BE 4366	PROCESS CONTROL IN BIOTECHNOLOGY
BE 4368	AN INTRODUCTION TO TISSUE ENGINEERING AND REGENERATIVE MEDICINE
BE 4372	DRUG DELIVERY SYSTEM
BE 4373	FORMULATION AND CHARACTERIZATION OF DRUG DELIVERY SYSTEMS
BE 4385	STEM CELL TISSUE ENGINEERING
BE 4388	MEDICAL PRODUCT DESIGN AND DEVELOPMENT
BIOL 3315	GENETICS
EE 3407	ELECTROMAGNETICS

Another course approved by advisor

Total Hours**127**

¹ Completion of both BE 1105 and BE 1325 with a grade of "C" or better satisfies the university's computer proficiency requirement.

More hours may be required to strengthen student's program or demonstrate proficiency. Total hours will depend upon prior preparation and academic qualifications. See Prior Preparation and Course Requirements under Admissions.

Refer to the College of Engineering section of this catalog for information concerning the following topics: Admission into Engineering, Admission into Pre-Engineering, Admission into the Professional Program, Counseling or Advising, Transfer and Change of Major Policies, Honors Program, Academic Regulations, Professional Engineering Registration, Cooperative Education, Academic Probation, Repeating Course Policy and Academic Dishonesty.

HEALTH PROFESSION TRACK (PRE-MED OR PRE-DENTAL, ETC.)

For those who plan to pursue degrees in medicine or dental science, the following additional course are required in preparation for taking MCAT or DAT. For details, please visit [Health Professions Advisor](http://www.uta.edu/science/programs/health-professions.php) (<http://www.uta.edu/science/programs/health-professions.php>), UT Arlington College of Science

Select at least 2 Biology courses from the following:

BIOL 2444	GENERAL MICROBIOLOGY	
BIOL 3312	IMMUNOLOGY	
BIOL 3315	GENETICS	
BIOL 3442	HUMAN PHYSIOLOGY	
CHEM 2321	ORGANIC CHEMISTRY I	3
CHEM 2181	ORGANIC CHEMISTRY I LABORATORY	1
CHEM 2322	ORGANIC CHEMISTRY II	3
CHEM 2182	ORGANIC CHEMISTRY II LABORATORY	1
CHEM 4311	BIOCHEMISTRY I	3
PSYC 1315	INTRODUCTION TO PSYCHOLOGY	3
SOCI 1311	INTRODUCTION TO SOCIOLOGY	3

BS TO DOCTOR OF OSTEOPATHIC MEDICINE

Qualified first-time undergraduate freshman may consider a [Bachelor of Science-to-Doctor of Osteopathic Medicine](https://www.uta.edu/academics/schools-colleges/engineering/academics/departments/bioengineering/bs-to-do/) (<https://www.uta.edu/academics/schools-colleges/engineering/academics/departments/bioengineering/bs-to-do/>) (DO) pathway from UTA's Bioengineering Department to the Texas College of Osteopathic Medicine at the UNT Health Science Center.

Program Completion

Academic performance requirements establishing satisfactory progress and grade point requirements are given in the College of Engineering section of this catalog.

GRADE REQUIREMENTS FOR BE COURSE PREREQUISITES

Biomedical Engineering majors (BE-Intended or BE) may not attempt a BE course until they have earned a grade of C or better in the prerequisite course(s).

REPEATING COURSES

Biomedical Engineering majors (BE-Intended or BE) may not attempt any course more than three times and apply that course toward a degree in Biomedical Engineering. Enrollment in a course for a period of time sufficient for assignment of a grade, including a grade of W, is considered an attempt.

GROUND FOR DISMISSAL FROM THE BE PROGRAM

Requirements for grounds for dismissal as a Biomedical Engineering major are governed by the requirements stated under the College of Engineering section of this catalog.

Advising Resources

First time in college students meet with engineering advisors in the UAEC (UAECengineering@uta.edu). Transfer students are advised prior to New Maverick Orientation by the department. Students, please read all student emails carefully and consult the department advising webpage for additional contact information and answers to common questions.

Location:

ERB 243

Email:

BEugadvising@uta.edu

Phone:

817-272-6250

Web:

Schedule an appointment (<https://www.uta.edu/academics/schools-colleges/engineering/academics/departments/bioengineering/students/>)