Biomedical Engineering (BS)

Faculty

**Professors:** Orlando Auciello, Stuart Cogan, Stephen D. Levene, Robert L. Rennaker II, David W. Schmidtke

**Associate Professors:** Shalini Prasad, Mario Romero-Ortega

**Assistant Professors:** Leonidas Bleris, Robert D. Gregg, Heather Hayenga, Seth A. Hays, Lan Ma, Hyun-Joo Nam, Danieli Rodrigues, Walter E. Voit, Jun Wang, Hyuntae Yoo

**Senior Lecturers:** Tariq Ali, Allison Case, Steve Foland, Clark A. Meyer, Todd W. Polk

Mission of the Department of Bioengineering

The mission of the Bioengineering Department is to provide a state-of-the-art, highly interdisciplinary, teaching and research environment for undergraduate and graduate students. Whether at undergraduate or post-graduate levels, our students will be able to reach across traditional disciplinary boundaries, and work effectively with experts in engineering, life sciences, and medicine. At the Bachelors level, our graduates will be ready to meet the rapidly growing demand for bioengineers, and tackle challenges in emerging areas, including but not limited to personalized medicine, biomedical devices, and targeted drug delivery. At the Masters and PhD levels, our graduates will undertake original cutting-edge research at the forefront of scientific and technological developments in bioengineering.

High School Preparation

Engineering education requires a strong high school preparation. Pre-engineering students should have high school preparation of at least one-half year in trigonometry and at least one year each in elementary algebra, intermediate and advanced algebra, plane geometry, chemistry, and physics, thus developing their competencies to the highest possible levels and preparing to move immediately into demanding college courses in calculus, calculus-based physics, and chemistry for science majors. It is also essential that pre-engineering students have the competence to read rapidly and with comprehension, and to write clearly and correctly.
Lower-Division Study

All lower-division students in Biomedical Engineering concentrate on mathematics, science, and introductory engineering courses, building competence in these cornerstone areas for future application in upper-division engineering courses. The following requirements apply both to students seeking to transfer to UT Dallas from other institutions as well as to those currently enrolled at UT Dallas, whether in another school or in the Erik Jonsson School of Engineering and Computer Science.

Academic Progress in Biomedical Engineering

In order to make satisfactory academic progress as a Biomedical Engineering major, a student must meet all university requirements for academic progress, and must earn a grade of C- or better in each of the "major requirements" courses. No "Major Requirement" course may be taken until the student has obtained a grade of C- or better in each of the prerequisites. If a higher grade requirement is stated for a specific class, the higher requirement applies.

Bachelor of Science in Biomedical Engineering

Degree Requirements (121 semester credit hours)

I. Core Curriculum Requirements: 42 semester credit hours

Communication: 6 semester credit hours
- RHET 1302 Rhetoric
- ECS 3390 Professional and Technical Communication

Mathematics: 3 semester credit hours
- MATH 2417 Calculus I

Life and Physical Sciences: 6 semester credit hours
- PHYS 2325 Mechanics
- PHYS 2326 Electromagnetism and Waves

Language, Philosophy and Culture: 3 semester credit hours
Select any 3 semester credit hours from Language, Philosophy and Culture core courses (see advisor)

Creative Arts: 3 semester credit hours
Select any 3 semester credit hours from Creative Arts core courses (see advisor)
American History: 6 semester credit hours
Select any 6 semester credit hours from American History core courses (see advisor)

Government / Political Science: 6 semester credit hours

GOVT 2305 American National Government
GOVT 2306 State and Local Government

Social and Behavioral Sciences: 3 semester credit hours

ECS 3361 Social Issues and Ethics in Computer Science and Engineering

Component Area Option: 6 semester credit hours

MATH 2417 Calculus I\(^4\)
MATH 2419 Calculus II\(^4\)
PHYS 2125 Physics Laboratory\(^5\)

II. Major Requirements: 79 semester credit hours\(^6\)

Major Preparatory Courses: 22 semester credit hours beyond Core Curriculum

CHEM 1111 General Chemistry Laboratory I\(^6\)
CHEM 1311 General Chemistry I\(^6\)
CHEM 1312 General Chemistry II
CHEM 1112 General Chemistry II Laboratory
CS 1324 Introduction to Programming for Biomedical Engineers
BIOL 2311 Introduction to Modern Biology I
BIOL 2111 Introduction to Modern Biology Workshop I
BIOL 2281 Introductory Biology Laboratory
MATH 2417 Calculus I\(^4\)
MATH 2419 Calculus II\(^4\)
MATH 2420 Differential Equations with Applications
PHYS 2125 Physics Laboratory I\(^5\)
PHYS 2126 Physics Laboratory II
PHYS 2325 Mechanics\(^5\)
Electromagnetism and Waves

Major Core Courses: 48 semester credit hours beyond Core Curriculum

- ECS 1200 Introduction to Engineering and Computer Science
- BMEN 1208 Introduction to Biomedical Engineering
- ENGR 2300 Linear Algebra for Engineers
- BMEN 2320 Statics
- ECS 3361 Social Issues and Ethics in Computer Science and Engineering
- ECS 3390 Professional and Technical Communication
- ENGR 3300 Advanced Engineering Mathematics
- EE 3302 Signals and Systems
- EE 3102 Signals and Systems Laboratory
- BMEN 3320 Electrical and Electronic Circuits in Biomedical Engineering
- BMEN 3120 Biomedical Circuits and Instrumentation Laboratory
- BMEN 3330 Engineering Physiology of the Human Body
- BMEN 3130 Engineering Physiology Laboratory
- ENGR 3341 Probability Theory and Statistics
- BMEN 3350 Biomedical Component and System Design
- BMEN 3150 Biomedical Engineering
- BMEN 3360 Thermodynamics
  or BMEN 3315 Thermodynamics and Physical Chemistry in Biomedical Engineering
- BMEN 4310 Feedback Systems in Biomedical Engineering
- BMEN 4110 Biomedical Feedback Systems Laboratory
- BMEN 4360 Biomaterials and Medical Devices
- BMEN 4388 Senior Design Project I
- BMEN 4389 Senior Design Project II

Prescribed Electives: 9 semester credit hours

Students pursuing the general program take 9 semester credit hours using any other BMEN 3000 level or higher class.
Fast Track Baccalaureate/Master's Degrees

In response to the need for advanced education in Biomedical engineering, a Fast Track program is available to well-qualified UT Dallas undergraduate students. The Fast Track program is designed to accelerate a student's education so that both a BS and an MS degree can be earned in five years of full-time study. This is accomplished by (1) taking courses (typically electives) during one or more summer semesters, and (2) beginning graduate coursework during the senior year. Details are available from the Associate Dean for Undergraduate Education.

Honors Program

The Department of Biomedical Engineering offers upper-division Honors for outstanding students in the BS Biomedical Engineering degree program. This program offers special sections of designated classes and other activities designed to enhance the educational experience of exceptional students. Admission to the Honors programs requires a 3.500 or better GPA in at least 30 semester credit hours of coursework. Graduation with Honors requires a 3.500 or better GPA and completion of at least 6 honors classes. These honors classes must include either Senior Honors (BMEN 4399) or Undergraduate Research in Biomedical Engineering (BMEN 4V98) and a Senior Honors Thesis must be completed within one of those two classes. While the topics may be related, the Senior Thesis does not replace the need for the student to complete a regular Senior Design Project. The other 5 honors classes can come from a mixture of Graduate level (up to a count of 4) classes and special honor sections of regular undergraduate BMEN classes (up to a count of 2).

Departmental Honors with Distinction may be awarded to students whose Senior Honors Thesis is judged by a faculty committee to be of exemplary quality. Only students graduating with Departmental Honors are eligible. Thesis/projects must be submitted by the deadline that applies to MS Theses in the graduating semester to allow for proper evaluation. Students interested in Honors with Distinction are encouraged to start working on their thesis/project a year prior to graduation.

Minors

The Department of Bioengineering does not offer minors at this time.

1. Incoming freshmen must complete and pass UNIV 1010 Freshman Seminar and the corresponding school-related freshman seminar course. Erik Jonsson School of Engineering and Computer Science majors must enroll and receive credit for ECS 1200 which will satisfy the UNIV 1010 graduation requirement. Students, including transfer students, who complete their core curriculum at UT Dallas must take UNIV 2020.
2. Curriculum Requirements can be fulfilled by other approved courses. The courses listed are recommended as the most efficient way to satisfy both Core Curriculum and Major Requirements at UT Dallas.
3. Semester credit hours fulfill the communication component of the Core Curriculum.
4. Three semester credit hours of Calculus are counted under Mathematics Core, and five semester credit hours of
Calculus are counted as Component Area Option Core.

5. Six semester credit hours of Physics are counted under Science core, and one semester credit hour of Physics (PHYS 2125) is counted as Component Area Option Core.

6. Students must pass each of the major requirement courses listed in this degree plan and each of their prerequisites, with a grade of C- or better.

7. Transfer students with sufficient background may petition to substitute upper-division semester credit hours in the major for this class.

8. Semester credit hours contribute to the Social and Behavioral Sciences component of the Core Curriculum.