# Erik Jonsson School of Engineering and Computer Science

## Department of Bioengineering

## Biomedical Engineering (B.S.)

### Faculty

**Professors**: Steven D. Levene, Mathukumalli Vidyasagar

**Associate Professor**: Shalini Prasad

**Assistant Professors:** Leonidas Bleris, Lan Ma, Hyun-Joo Nam, Hyuntae Yoo

**Affiliated Faculty**: Dinesh Bhatia (Electrical Engineering), Xin-Lin Gao (Mechanical Engineering), Jinming Gao (UT Southwestern), Michael Kilgard (Brain and Behavioral Science), Raimund Ober (Electrical Engineering), Issa Panahi (Electrical Engineering), Balakrishnan Prabhakaran (Computer Science), Robert Rennaker (Brain and Behavioral Science), A. Dean Sherry (Chemistry), Zhenyu Xuan (Molecular and Cell Biology, Michael Q. Zhang (Molecular and Cell Biology)

### 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 core 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 (126 semester credit hours)

### I. Core Curriculum Requirements[1]: 42 semester credit hours

**Communication (6 semester credit hours)**

3 semester credit hours Rhetoric (RHET 1302)

3 semester credit hours Professional and Technical Communication (ECS 3390)[2]

**Social and Behavioral Sciences (15 semester credit hours)**

6 semester credit hours Government (GOVT 2301 and GOVT 2302)

6 semester credit hours American History

3 semester credit hours Social Issues and Ethics in Computer Science and Engineering elective (ECS 3361)[2]

**Humanities and Fine Arts (6 semester credit hours)**

3 semester credit hours Fine Arts (ARTS 1301)

3 semester credit hours Humanities (HUMA 1301)

**Mathematics and Quantitative Reasoning (6 semester credit hours)**

6 semester credit hours Calculus (MATH 2417 and MATH 2419)[3]

**Science (9 semester credit hours)**

8 semester credit hours Physics (PHYS 2325, PHYS 2125, PHYS 2326 and PHYS 2126)

4 semester credit hours Chemistry (CHEM 1311 and CHEM 1111)[4]

## II. Major Requirements: 82 semester credit hours[5]

**Major Preparatory Courses (26 semester credit hours beyond Core Curriculum)**

CHEM 1111 General Chemistry Laboratory I[4, 5]

CHEM 1311 General Chemistry I[4, 5]

CHEM 1312 General Chemistry II

CHEM 1112 General Chemistry II Laboratory

CS 1325 Introduction to Programming

BIOL 2311 Introduction to Modern Biology I

BIOL 2111 Introduction to Modern Biology Workshop I

BIOL 2312 Introduction to Modern Biology II

BIOL 2112 Introduction to Modern Biology Workshop II

BIOL 2281 Introductory Biology Laboratory

MATH 2417 Calculus I[3]

MATH 2419 Calculus II[3]

MATH 2420 Differential Equations with Applications

PHYS 2125 Physics Laboratory I

PHYS 2126 Physics Laboratory II

PHYS 2325 Mechanics

PHYS 2326 Electromagnetism and Waves

**Major Core Courses (53 semester credit hours beyond Core Curriculum)**

ECS 1200 Introduction to Engineering and Computer Science[6]

BMEN 1208 Introduction to Biomedical Engineering[6]

ENGR 2300 Linear Algebra for Engineers

BMEN 2310 Static Equilibrium and Rigid Body Dynamics

ECS 3361 Social Issues and Ethics in Computer Science and Engineering[7]

ECS 3390 Professional and Technical Communication[2]

ENGR 3300 Advanced Engineering Mathematics

BMEN 3301 Introduction to Biomechanics

BMEN 3101 Biomechanics Laboratory

EE 3302 Signals and Systems

EE 3102 Signals and Systems Laboratory

BMEN 3310 Fluid Mechanics and Transport Processes in Biomedical Engineering

BMEN 3110 Biomedical Transport Processes Laboratory

BMEN 3320 Electrical and Electronic Circuits in Biomedical Engineering

BMEN 3120 Biomedical Circuits and Instrumentation Laboratory

BMEN 3315 Thermodynamics and Physical Chemistry in Biomedical Engineering

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 Laboratory

BMEN 4310 Feedback Systems in Biomedical Engineering

or EE 4310 Systems and Controls

BMEN 4110 Biomedical Feedback Systems Laboratory

BMEN 4388 Senior Design Project I

BMEN 4389 Senior Design Project II

**Prescribed Electives (3 semester credit hours)**

Students pursuing the general program take 3 semester credit hours from the list below:

BMEN 4320 Intermediate Electrical Systems

BMEN 4330 Advanced Engineering Physiology of the Human Body

BMEN 4350 Applied Sensor Technology

### III. Elective Requirements: 2 semester credit hours

**Advanced Electives (6 semester credit hours)**

All students are required to take at least six semester credit hours of advanced electives outside their major field of study. These must be either upper-division classes or lower-division classes that have prerequisites. Six semester credit hours may be satisfied with BIOL 2311, BIOL 2312 counted under Major Preparatory courses.

**Free Electives (2 semester credit hours)**

Both lower-and upper division courses may count as free electives, but students must complete at least 51 semester credit hours of upper-division credit to qualify for graduation.

## Fast Track Baccalaureate/Master's Degrees

In response to the need for advanced education in Biomedical engineering, a Fast Track program is available to exceptionally well-qualified UT Dallas undergraduate students who meet the requirements for admission to the graduate school. The Fast Track program is designed to accelerate a student's education so that both a B.S. and an M.S. 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 course work during the senior year. Details of the requirements for admission to this program 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 B.S. 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 M.S. 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. Curriculum Requirements can be fulfilled by other approved courses from accredited institutions of higher education. The courses listed in parentheses are recommended as the most efficient way to satisfy both Core Curriculum and Major Requirements at UT Dallas.
2. Hours fulfill the communication elective of the Core Curriculum.
3. Six semester credit hours of Calculus are counted under Mathematics Core, and two semester credit hours of Calculus are counted as Major Preparatory Courses.
4. One semester credit hour of General Chemistry I and General Chemistry I Laboratory is counted under Science core, and three semester credit hours are counted as Major Preparatory Courses.
5. Students must pass each of the EE, CS, Math and Science courses listed in this degree plan and each of their prerequisites, with a grade of C- or better.
6. Transfer students with sufficient background may petition to substitute upper level semester credit hours in the major for this class.
7. Hours contribute to the Social and Behavioral Sciences component of the Core Curriculum.

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