

Biomedical Engineering (BSBiomedE/MSE)

Integrated Bachelor of Science in Biomedical Engineering/Master of Science in Engineering Program

The integrated degree program results in simultaneously awarding a Bachelor of Science in Biomedical Engineering (BSBME) and a Master of Science in Engineering (MSE) degree offered by the graduate program in biomedical engineering. The objective of the Integrated BSBME/MSE Program is to enable prepared undergraduates in Biomedical Engineering to earn two degrees in a shortened time period. By applying AP and Credit by Exam courses, having students take recommended summer courses, and allowing seniors to enroll in graduate-level engineering courses reserved for graduate credit, the program enables graduates to complete both degree requirements in five years.

Admission

Current undergraduate BME students may begin the application process to the Integrated BSBME/MSE Program option in the first term of their third year. Admission includes the two steps outlined below. Undergraduate students not in the biomedical engineering major are not eligible to apply. It is expected that all students selected for the program in Step 1 and have been successful in their first graduate-level coursework will be selected for admission in Step 2. Successful completion will be evaluated and determined by the department's Domestic Graduate Admission Committee and the Graduate Advisor.

Step 1. Students go through the first step in application for admission to the Integrated BSBME/MSE Program in the second term of the third year. The Step 1 application is internal through the department and includes a resume, statement of purpose, and letters of recommendation. Qualified applicants will be selected based on the applicant's progress to degree completion, grade point average, and other qualifications included in the application materials. Selected students will be notified early in the summer after the third year of their admission status for the integrated program, allowing them to meet with an academic advisor to plan graduate coursework in the first term of their fourth year.

Step 2. Students go through the second step in the application after the second term of their fourth year. The Step 2 application is formal through the Office of Graduate Admissions (OGA) and includes a resume, statement of purpose, letters of recommendation, and a TOEFL score (if required). Qualified applicants will be selected based on success in graduate-level engineering courses in the first term of their fourth year, grade point average, and other qualifications included in the application materials.

If a student in their fourth year is taking graduate courses and would be on track to complete the integrated program but did not apply in their third year through Step 1, they may also choose to apply in Step 2 and formally apply through OGA by the normal admission deadline. These students will be evaluated for admission on the same criteria.

Advising

Once admitted, students will be advised each semester by the graduate advisor and an academic advisor to complete coursework required for the BSBME degree in their fourth year, and completion of the coursework required for the MSE degree in their fourth and fifth years.

Information regarding the integrated program requirements and policies may be obtained from the Biomedical Engineering Academic Advising Office.

Licensure

Preparation for Health Professions

Students who plan to attend medical or dental school in Texas must complete coursework in addition to that required for the degree to meet professional school admission requirements; those who plan to attend schools outside Texas may need additional coursework. The student is responsible for knowing and meeting these additional requirements, and assistance and information are available in the Health Professions Office in Natural Sciences. Additional information about preparation for health professions is available [online](#).

Preparation for Law

There is no sequential arrangement of courses prescribed for a pre-law program. The Association of American Law Schools puts special emphasis on comprehension and expression in words, critical understanding of the human institutions and values with which the law deals, and analytical power in thinking. Courses relevant to these objectives deal with communication of ideas, logic, mathematics, social sciences, history, philosophy, and the physical sciences. Services for pre-law students are provided to students in all colleges by Liberal Arts Career Services, and to engineering students by the Engineering Career Assistance Center (ECAC). Additional information about preparation for law is available [online](#).

Objectives

Achievement of the program outcomes gives students the foundation for accomplishing the biomedical engineering program educational objectives. A few years after graduation, students are expected to be able to:

- Conduct themselves with exemplary professional ethics and highest integrity
- Demonstrate a quantitative, analytical, and systems approach to problem solving in their professional practice
- Demonstrate a continuous quest for professional excellence and success
- Participate in continuing education to expand their knowledge of contemporary professional issues
- Exhibit effective scientific, technical, communication, and resource management skills in their professional practice

Outcomes

Graduates of the biomedical engineering program are expected to have:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specific needs with consideration of public health, safety, and welfare, as well as global, cultural, societal, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

- an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions
- an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Total Hours Required: 156

Undergraduate: 126

Graduate 30

Plan of Study

The Plan of Study is a suggested four-year course sequence to support academic planning and serves as a helpful guide. Currently enrolled students should meet with their academic advisor to tailor their course selections and timelines to their individual goals and circumstances.

Course	Title	Hours
Year 1		
Semester 1		
BME 303L	Introduction to Biomedical Engineering Design	3
CH 301	Principles of Chemistry I	3
BIO 311C	Introductory Biology I	3
BIO 206L	Introductory Laboratory Experiments in Biology	2
M 408C	Differential and Integral Calculus	4
<u>First-Year Signature Course (090)</u>		3
Hours		18
Semester 2		
BME 303	Introduction to Computing	3
CH 302	Principles of Chemistry II	3
CH 204	Introduction to Chemical Practice	2
M 408D	Sequences, Series, and Multivariable Calculus	4
PHY 303K	Engineering Physics I	3
PHY 105M	Laboratory For Physics 302K, 303K, and 317K	1
RHE 306	Rhetoric and Writing	3
Hours		19
Year 2		
Semester 1		
BME 214L	Computational Fundamentals of Biomedical Engineering Design	2
BME 311	Network Analysis in Biomedical Engineering (advisor approval required)	3
CH 328M or CH 320M	Organic Chemistry I or Organic Chemistry I	3
M 427J	Differential Equations with Linear Algebra	4
PHY 303L	Engineering Physics II	3
PHY 105N	Laboratory For Physics 302L, 303L, and 317L	1
Hours		16
Semester 2		
E S 333T	Engineering Communication	3
BME 313L	Introduction to Numerical Methods in Biomedical Engineering	3
BME 335	Engineering Probability and Statistics	3
BME 344	Biomechanics (advisor approval required)	3
BCH 369	Fundamentals of Biochemistry	3
<u>Social and Behavioral Sciences (080)</u>		3
Hours		18
Year 3		
Semester 1		
BME 245L	Experimental Principles of Biomedical Engineering Design	2
BME 343	Biomedical Engineering Signal and Systems Analysis	3

BME 365R	Quantitative Engineering Physiology I	3
BME 352	Engineering Biomaterials	3
Technical Elective		3
<u>Humanities (040)</u>		3
Hours		17
Semester 2		
BME 261L	Development and Analysis in Biomedical Engineering Design	2
BME 349	Biomedical Instrumentation	3
BME 365S	Quantitative Engineering Physiology II	3
BME 353	Transport Phenomena in Living Systems	3
BME 355	Molecular Engineering (advisor approval required)	3
Technical Elective		3
Hours		17
Year 4		
Semester 1		
BME 370	Biomedical Engineering Capstone Design I	3
<u>Visual and Performing Arts (050)</u>		3
<u>U.S. History (060)</u>		3
<u>American and Texas Government (070)</u>		3
Hours		12
Semester 2		
BME 371	Biomedical Engineering Capstone Design II	3
<u>U.S. History (060)</u>		3
<u>American and Texas Government (070)</u>		3
Graduate coursework		6
Hours		15
Semester 3		
Graduate Coursework		6
Hours		6
Year 5		
Semester 1		
Graduate Coursework		9
Hours		9
Semester 2		
Graduate Coursework		9
Hours		9
Total Hours		156

Requirements

All requirements are listed below, starting with the most specialized moving to the most general. Additional requirements may follow the table, so be sure to read the entire page. Some required courses listed below may also satisfy [General Education](#) requirements, including [Core Curriculum](#).

Code	Title	Hours
Undergraduate		
Concentration		
Hours chosen from: Technical area engineering electives (see below)		6
<i>Subtotal</i>		6
Degree (see details below)		96
Free electives: Additional coursework to reach total hours required.		0
<i>Subtotal</i>		96
<u>General Education</u>		
<u>Remaining Core Curriculum (42 hours total)</u>		24
<u>Foreign Language other than English, Beginning Proficiency</u>		
<i>Subtotal</i>		24
<u>College Requirements - Engineering</u>		
<u>General University Requirements</u>		
Graduate Degree		30

<i>Subtotal</i>	30
<u>Graduate Engineering Requirements</u>	
<u>Graduate University Requirements</u>	
Total Hours	156

Additional Requirements and Policies

In order for integrated program students to complete both the BSBME and MSE degrees in five years, the department waives six semester credit hours (SCH) of technical area electives in lieu of six hours of graduate engineering reserved for graduate credit taken in the fourth year. This reduces the total undergraduate degree requirements for integrated program students from 132 to 126 hours. The remaining required six hours of technical area electives required for the undergraduate degree must be taken in engineering (see concentrations below).

Students complete 12 hours of graduate coursework in their fourth year and 18 hours of graduate coursework in their fifth year to complete a total of 30 SCH of graduate coursework for the graduate degree as described in the [Graduate Catalog](#). Students have the option of choosing the coursework or thesis options for the MSE degree as described in the [Graduate Catalog](#). Which courses the student takes will be determined with the graduate advisor and academic advisor to ensure compliance with degree requirements and meet the students' career goals.

Students unable to successfully complete the integrated program, or who wish to terminate pursuit of the graduate degree for any reason, may obtain an undergraduate degree by satisfying all of the requirements for the standalone degree. Six graduate hours taken in the fourth year may count toward 12 hours of technical area electives required to complete the entire 132 hours required. An undergraduate leaving the integrated program will be on a trajectory to graduate with the undergraduate degree in the same timeframe prior to admission to the integrated program.

Graduates of the integrated program will receive both degrees simultaneously after successfully completing the 126 undergraduate hours and 30 graduate hours required, to reach a total of 156 hours. It is expected that students in this program will graduate with both degrees in a total of five years to completion.

Concentrations

For a list of courses in the Concentration options, please see the below pages under either Concentration on the Requirements tab or on the Course Lists tab. The courses must be engineering courses.

- [Biomedical Engineering, Biomedical Imaging and Instrumentation \(BSBiomedE\)](#)
- [Biomedical Engineering, Cellular and Biomolecular Engineering \(BSBiomedE\)](#)
- [Biomedical Engineering, Computational Biomedical Engineering \(BSBiomedE\)](#)
- [Biomedical Engineering, Molecular, Cellular, and Tissue Biomechanics \(BSBiomedE\)](#)

Degree-Bachelor of Science in Biomedical Engineering (BSBiomedE) Requirements

Code	Title	Hours
Degree		
<i>Biomedical Engineering</i>		

BME 214L	Computational Fundamentals of Biomedical Engineering Design	2
BME 245L	Experimental Principles of Biomedical Engineering Design	2
BME 261L	Development and Analysis in Biomedical Engineering Design	2
BME 303	Introduction to Computing	3
BME 303L	Introduction to Biomedical Engineering Design	3
BME 311	Network Analysis in Biomedical Engineering (advisor approval required)	3
BME 313L	Introduction to Numerical Methods in Biomedical Engineering	3
BME 335	Engineering Probability and Statistics	3
BME 343	Biomedical Engineering Signal and Systems Analysis	3
BME 344	Biomechanics (advisor approval required)	3
BME 349	Biomedical Instrumentation	3
BME 352	Engineering Biomaterials	3
BME 353	Transport Phenomena in Living Systems	3
BME 355	Molecular Engineering	3
BME 365R	Quantitative Engineering Physiology I	3
BME 365S	Quantitative Engineering Physiology II	3
BME 370	Biomedical Engineering Capstone Design I	3
BME 371	Biomedical Engineering Capstone Design II	3
<i>Subtotal</i>		51
<i>Biochemistry and Biology</i>		
BCH 369	Fundamentals of Biochemistry	3
BIO 206L	Introductory Laboratory Experiments in Biology	2
BIO 311C	Introductory Biology I	3
<i>Subtotal</i>		8
<i>Chemistry</i>		
CH 401	Principles of Chemistry I	4
CH 402	Principles of Chemistry II	4
CH 320M	Organic Chemistry I	3
or CH 328M	Organic Chemistry I	
<i>Subtotal</i>		11
<i>Mathematics</i>		
M 408C	Differential and Integral Calculus	4
M 408D	Sequences, Series, and Multivariable Calculus	4
M 427J	Differential Equations with Linear Algebra	4
<i>Subtotal</i>		12
<i>Physics</i>		
PHY 105M	Laboratory For Physics 302K, 303K, and 317K	1
PHY 105N	Laboratory For Physics 302L, 303L, and 317L	1
PHY 303K	Engineering Physics I	3
PHY 303L	Engineering Physics II	3
<i>Subtotal</i>		8
<i>Rhetoric and Writing</i>		
RHE 306	Rhetoric and Writing	3
<i>Additional Required Hours</i>		
E S 333T	Engineering Communication	3
<i>Subtotal</i>		6
Total Hours		96

Additional Requirements and Policies

Prior to registration, students must receive approval from the advising office for courses to be used to fulfill technical and nontechnical course requirements. The student must take all courses required for the degree on the letter-grade basis and must earn a grade of at least C- in each, except for those listed as remaining Core Curriculum.

Each student should choose a concentration by the end of the sophomore year and plan an academic program to meet the area requirements during the next two years.

Plan II Honors Program

Students enrolled in the Plan II Honors Program are encouraged to contact the Biomedical Engineering Academic Advising Office, in addition to the Plan II Office to ensure that requirements for both programs are met. Plan II courses may count toward biomedical engineering program requirements.