BIOMEDICAL ENGINEERING, B.S.

At Saint Louis University’s Parks College of Engineering, Aviation and Technology, we have developed an innovative, future-focused biomedical engineering program that incorporates the latest trends in the industry to address the current and future needs of the profession and our society.

Our curriculum has a strong focus on the principles of both engineering and medicine. As a student in the biomedical engineering program at SLU, you will be challenged to integrate your knowledge of the biological and physical sciences with the engineering skills you are developing by participating in hands-on projects inside and outside the classroom. In addition, the flexibility of the biomedical engineering program means it can accommodate students with a wide variety of interests.

You will graduate prepared for a number of careers in the health care industry, ranging from fundamental research in science and engineering to the direct application of your knowledge to improve health and the overall quality of life for humanity.

Curriculum Overview

SLU’s B.S. degree in biomedical engineering is designed with three tracks to accommodate the different career paths our students take after graduation: pre-health, graduate school and industry. Biomedical engineering courses and laboratory experiences at SLU provide a broad fundamental preparation for any of these paths.

The program is designed with an emphasis on providing a BME focus in all core engineering classes, informed by research, into the student experience from the very beginning. The major also offers considerable flexibility, allowing time for electives within and outside the program.

Because of the flexibility in our degree, our undergraduates participate in a number of academic programs across campus, including the Medical Scholars Program and the University Honors Program. Biomedical engineering majors at SLU can complete certificates, minors or second majors in a variety of disciplines ranging from the liberal arts or science to business or technology. The program also offers a minor for students interested in developing a focused study within the field of BME.

Fieldwork and Research Opportunities

Many laboratory experiences coincide with courses in the basic sciences and engineering. Each BME student at SLU completes a senior capstone design project, a hands-on experience. This year-long project may be explored as an individual, but the projects most often involve groups of students from biomedical engineering, other engineering or computer science departments, biological or medical departments, or engineers from corporations. The capstone course is designed to fully embed the student in a project that will challenge even the exceptional student to integrate their previous training and to develop their abilities as an engineer.

SLU’s well-equipped laboratories emphasize measurement techniques and experimental methods. Each biomedical engineering student’s sequence of courses will vary according to credits taken in high school, ability level, individual preference and career goals.

In addition, all students in the biomedical engineering program are exposed to concepts of entrepreneurship and an entrepreneurial mindset through the curriculum and extracurricular opportunities.

The flexibility available within the major offers students an increased opportunity to experience research. More than 25% of our undergraduate student population takes part in an organized research experience within the program.

Careers

There are a variety of career paths to choose from as a biomedical engineer, including industrial or consulting positions; graduate school; and professional schools such as medicine, veterinary medicine or business administration. SLU’s curriculum allows BME students to specialize in and explore the biomedical engineering program, while still providing a solid background in biological/physical sciences, mathematics and basic engineering.

Admission Requirements

Freshman

Begin your application for this program at www.slu.edu/apply. Saint Louis University also accepts the Common App.

All applications are thoroughly reviewed with the highest degree of individual care and consideration to all credentials that are submitted. Solid academic performance in college preparatory course work is a primary concern in reviewing a freshman applicant’s file. College admission test scores (ACT or SAT) are used as an additional indicator of the student’s ability to meet the academic rigors of Saint Louis University and are used as qualifiers for certain University scholarship programs. To be considered for admission to any Saint Louis University undergraduate program, the applicant must be graduating from an accredited high school or have an acceptable score on the General Education Development (GED) test.

Begin Your Application

Transfer

Begin your application for this program at www.slu.edu/apply.

Applicants must be a graduate of an accredited high school or have an acceptable score on the GED. An official high school transcript and official test scores are required only of those students who have attempted fewer than 24 transferable semester credits (or 30 quarter credits) of college credit. Those having completed 24 or more of college credit need only submit a transcript from previously attended college(s). In reviewing a transfer applicant’s file, the office of admission holistically examines the student’s academic performance in college-level coursework as an indicator of the student’s ability to meet the academic rigors of Saint Louis University.

International Applicants

Begin your application for this program at www.slu.edu/apply.

All admission policies and requirements for domestic students apply to international students along with the following:
For priority consideration for merit-based scholarships, apply for financial aid by March 1. For admission by Dec. 1 and complete a Free Application for Federal Student Aid (FAFSA) by March 1.

There are two principal ways to help finance a Saint Louis University education:

- **Scholarships**: Awarded based on academic achievement, service, leadership and financial need.
- **Financial Aid**: Provided in the form of grants and loans, some of which require repayment.

For information on other scholarships and financial aid, visit the student financial services office online at https://www.slu.edu/financial-aid/.

### Scholarships and Financial Aid

For priority consideration for merit-based scholarships, apply for financial aid by March 1.

### Additional Admission Requirements

In addition to the general admission and matriculation requirements of the University, Parks College engineering programs have the following additional requirements:

- **GPA**: Minimum cumulative 3.00 high school GPA for freshmen applicants and 2.70 college GPA for transfer applicants.
- **ACT/SAT**: ACT composite score of 24 or higher, or SAT composite score of 1160 or higher. ACT sub scores minimums of 22 in English, 24 in Mathematics, 22 in Reading Comprehension and 22 in Scientific Reasoning, or SAT Math sub score of 620.
- **Coursework**: Fifteen total units of high school work are required: three or four units of English; four or more units of mathematics including algebra I and II, geometry and precalculus (Algebra II with Trigonometry is not sufficient). Students should be prepared to start the first semester freshmen year in Calculus I or higher; three or four units of science including general science, introduction to physical science, earth science, biology, physics or chemistry; two or three units of social sciences including history, psychology or sociology; and three units of electives.

Admission requirements to Parks College of Engineering, Aviation and Technology degree programs are based on a combination of secondary school grades, college admission test scores, co-curricular activities and attempted college course work, as well as other indicators of the applicant’s ability, career focus and character. This process respects the non-discrimination policy of the University and is designed to select a qualified, competent and diverse student body with high standards of scholarship and character, consistent with the mission of the University.

### Scholarships and Financial Aid

For information on other scholarships and financial aid, visit the student financial aid office online at https://www.slu.edu/financial-aid/.

### Accreditation

The aerospace engineering, biomedical engineering, civil engineering, computer engineering, electrical engineering, engineering physics and mechanical engineering undergraduate curricula are accredited by the Engineering Accreditation Commission of ABET, www.abet.org (https://www.abet.org).

Enrollment and graduation data for biomedical engineering is listed here (http://www.slu.edu/parks/pdfs/biomedical-engineering-enrollment-and-graduation-data.pdf)

### Learning Outcomes

The undergraduate biomedical engineering program is accredited by the Engineering Accreditation Commission of ABET (http://www.abet.org/).

#### Program Educational Objectives

The undergraduate program is designed to meet the following specific objectives in order to fulfill the programmatic and institutional missions.

- Graduates will have established themselves as practicing engineers in biomedical engineering and health-related positions in industry, government and academia.
- Graduates will have acquired advanced degrees or be engaged in advanced study in biomedical engineering or other fields related to their long-term career goals.
- Graduates will attain a major milestone in their career development within the first five to seven years.

#### Student Outcomes

Graduates of the BME program at Saint Louis University will demonstrate:

- An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- An ability to 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
- An ability to communicate effectively with a range of audiences
- An ability to 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
- 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 judgment to draw conclusions
- An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Additionally, our graduates will have experience in:
- Applying principles of engineering, biology, human physiology, chemistry, calculus-based physics, mathematics (through differential equations) and statistics
- Solving bio/biomedical engineering problems, including those associated with the interaction between living and non-living systems
- Analyzing, modeling, designing, and realizing bio/biomedical engineering devices, systems, components or processes
- Making measurements on and interpreting data from living systems

Requirements

The biomedical engineering curriculum satisfies the Parks College requirements, and includes the flexibility, through electives, to tailor the curriculum for each individual student.

All BME courses with the exception of BME 1000 Introduction to Biomedical Engineering I (1 cr) have prerequisites that require a “C-“ or better.

Any waiver of a specified prerequisite for a course must be approved by the BME faculty member offering that course.

### Code | Title | Credits
--- | --- | ---
CHEM 1110 | General Chemistry I | 4
& CHEM 1115 | and General Chemistry 1 Laboratory | 4
CHEM 1120 | General Chemistry 2 | 4
& CHEM 1125 | and General Chemistry 2 Laboratory | 4
BIOL 1240 | General Biology: Information Flow and Evolution | 4
& BIOL 1245 | and Principles of Biology I Laboratory | 4
PHYS 1610 | Engineering Physics I | 4
& PHYS 1620 | and Engineering Physics I Laboratory | 4
PHYS 1630 | Engineering Physics II | 4
& PHYS 1640 | and Engineering Physics II Laboratory | 4
MATH 1510 | Calculus I | 4
MATH 1520 | Calculus II | 4
MATH 2530 | Calculus III | 4
MATH 3550 | Differential Equations | 3
MATH 3850 | Foundation of Statistics | 3

### Code | Title | Credits
--- | --- | ---
BME 2000 | Biomedical Engineering Computing | 3
BME 2200 | Applied Physiology for Engineers | 3
BME 3100 | Signals | 3
BME 3300 | Transport Fundamentals | 3
BME 3400 | Materials Science | 3
BME 3840 | Junior Lab | 1
BME 3150 | Biomedical Instrumentation | 3
BME 4950 | Senior Project I | 3
BME 4960 | Senior Project II | 3

### Advanced Biomedical Engineering

Select six of the following:

- BME 4100 | Biomedical Signals | 3
- BME 4130 | Medical Imaging | 3
- BME 4150 | Brain Computer Interface | 3
- BME 4200 | Biomechanics | 3
- BME 4210 | Human Movement Biomechanics | 3
- BME 4300 | Biotransport | 3
- BME 4320 | Drug Delivery | 3
- BME 4400 | Biomaterials | 3
- BME 4410 | Tissue Engineering | 3
- BME 4430 | Regenerative Engineering | 3
- BME 4600 | Quantitative Physiology I | 3
- BME 4650 | Quantitative Physiology II | 3
- BME 4980 | Independent Research | 3

### BME-Related General Electives

Select 9 credits

1. Cultural Diversity elective courses must be selected from an approved Arts & Sciences list. See the description of the Parks College core above for more information.

2. BME-Related general electives should be selected in accordance with the student's long-term educational and career goals. Often, students use these credits for advanced work in math, science, and engineering. However, students may also select courses designed to broaden their education in areas such as liberal arts or business. In all cases the permission of the academic advisor and Program Coordinator is required. Under no circumstances can prerequisite courses be used as general electives, e.g., Pre-Calculus (MATH 1400 Pre-Calculus (3 cr)) or The Process of Composition (ENGL 1500 The Process of Composition (3 cr)).

### Humanities Courses Include

- Fine arts (excludes applied, studio, and performance courses)
- Literature (ENGL 2020 Introduction to Literary Study (3 cr)-ENGL 2750 Film, Culture and Literature (3 cr), ENGL 3190 Literature of Ridicule and Satire (3 cr)-ENGL 3740 Medicine and Literature (3 cr), ENGL 4130 Literary Theory (3 cr)-ENGL 4890 Special Topics: American Literature & Culture (3 cr))
- History
- American studies and
- Foreign studies
- Foreign languages (excludes English or native language)
Social and Behavioral Sciences Courses Include

- Anthropology
- Communication (CMM 1000 Human Communication and Culture (3 cr), CMM 2000 Communication Theory (3 cr), CMM 2800 Communication Research (3 cr))
- Communication sciences and disorders (CSDI 1000 Introduction to Communication Sciences and Disorders (3 cr), CSDI 4700 Clinical Practicum (1 cr))
- Economics
- Education (EDSP 4240 Classroom Organization and Management (Early Childhood, ECSE, Elementary, Special Education), EDF 3620 Multicultural Issues in the Classroom (3 cr), EDSP 4310 Ed & Psych of the Exp Ind (3 cr))
- Political science
- Public health
- Psychology
- Social work (SWRK 1000 Introduction to Social Work (3 cr), SWRK 2100 Human Behavior & the Social Environment (3 cr), SWRK 3100 Social Policy for Social Justice (3 cr), SWRK 3200 Diversity & Anti-Oppression Practice (3 cr))
- Sociology and
- Criminology and criminal justice

Non-Technical Elective Shall be Chosen From

- Philosophy
- Theology
- Humanities
- Cultural diversity or
- Social and behavioral sciences

Continuation Standards

- Students must maintain a minimum 2.00 GPA.

Roadmap

Roadmaps are recommended semester-by-semester plans of study for programs and assume full-time enrollment unless otherwise noted.

Courses and milestones designated as critical (marked with !) must be completed in the semester listed to ensure a timely graduation. Transfer credit may change the roadmap.

This roadmap should not be used in the place of regular academic advising appointments. All students are encouraged to meet with their advisor/mentor each semester. Requirements, course availability and sequencing are subject to change.

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<tr>
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<th>Credits</th>
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<td><strong>Year One</strong></td>
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<tr>
<td>!BME 1000</td>
<td>Introduction to Biomedical Engineering I</td>
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<tr>
<td>BIOL 1240 &amp; BIOL 1245</td>
<td>General Biology: Information Flow and Evolution and Principles of Biology I Laboratory</td>
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<td>! CHEM 1110 &amp; CHEM 1115</td>
<td>General Chemistry 1 and General Chemistry 1 Laboratory</td>
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<td>Advanced Strategies Of Rhetoric and Research</td>
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<td>BME 2200</td>
<td>Applied Physiology for Engineers</td>
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<td>MENG 2011</td>
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<td>Transport Fundamentals</td>
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