

# BIOMEDICAL ENGINEERING, M.S.

The Master of Science in Biomedical Engineering, program at Saint Louis University will focus on independent research and innovation, pursuit of academic excellence, strong industry partnerships, innovative teaching methodologies, and diversity and inclusion. These elements will collectively prepare students for successful careers and address the evolving needs of the region, nation and world.

As part of their degrees, the students will take graduate-level courses to deepen their knowledge, understanding, and skills in the discipline as well as perform independent discovery or design-focused original research under the guidance of SLU's graduate faculty members.

## Curriculum Overview

This is a 30-credit-hour degree program. This includes 6 credit hours taken from a set of foundational courses. In addition to 15 hours of electives, which includes some interdisciplinary options, students completing the thesis option will take 6 credit hours of BME 5990 along with required courses in research analysis and technical communication. Students completing the non-thesis option will take additional coursework.

## Fieldwork and Research Opportunities

School of Science and Engineering graduate students gain valuable experience working with both faculty and peers. Additional opportunities to publish in scientific journals and attend professional conferences prepare our graduates for careers in industry or academia.

Saint Louis University's location in a vibrant and industry-rich city means that faculty members have access to and relationships with industry professionals. The School of Science and Engineering provides many opportunities for these professionals to interact with students, share their real-world experiences, network and even collaborate on research projects. Therefore, students have access not only to top-notch faculty but to the most recent developments in industry.

The expert faculty of the School of Science and Engineering collaborate with graduate students in groundbreaking research in the following areas:

- Biomaterials
- Human movement
- Drug delivery
- Engineering education
- Haptic and human-machine interfaces
- Innovation and entrepreneurship
- Biomechanics
- Mechanotransduction
- Neuroengineering
- Tissue-engineering and regenerative medicine

## Careers

Graduates of the master's program seek employment in the industry, government or as university professors. Many go on to doctoral studies.

## Admission Requirements

Begin your application for this program at <https://gradapply.slu.edu/apply/>.

Most admitted students meet the following criteria:

- Undergraduate cumulative GPA of at least 2.75; cumulative GPA of 3.00 preferred.
- A four-year B.S. degree in Biomedical Engineering, Bioengineering, Biochemical/Biomolecular/Bioelectrical Engineering or closely related engineering and science disciplines

## Application Requirements

- Application form
- Transcript(s) from all colleges and universities attended
- Three letters of recommendation (preferably from recent instructors) FOR THESIS APPLICANTS ONLY
- Résumé or curriculum vitae
- Professional goal statement. The statement should clearly indicate students' interest in Biomedical Engineering, identify professional/research goals, and describe students' anticipated contributions to SLU.

## Requirements for International Students

Along with the general admission requirements above, the following must be provided by prospective international students:

- Demonstration of English Language Proficiency (<https://catalog.slu.edu/academic-policies/office-admission/graduate/english-language-proficiency/>).
- Proof of financial support that must include:
  - A letter of financial support from the person(s) or sponsoring agency funding the time at Saint Louis University.
  - A letter from the sponsor's bank verifying that the funds are available and will be so for the duration of study at the University.
- Academic records, in English translation, for postsecondary studies outside the United States. These must include the courses taken and/or lectures attended, practical laboratory work, the maximum and minimum grades attainable, the grades earned or the results of all end-of-term examinations, and any honors or degrees received. WES and ECE transcripts are accepted.

## Review Process

Applications for the non-thesis track will be quickly evaluated and admission decisions will be communicated to the applicant, usually within two weeks.

Applications for the thesis track will be sent to the BME Department for evaluation and an admission decision. Outstanding applicants may be recommended for immediate acceptance, while others may be rejected or placed on a waiting list. Thesis track acceptance decisions will also be based on BME faculty expertise and lab openings. The goal is to ensure a successful match with a faculty member to conduct a research project that is in alignment with the student's preparation, interest, and career goals.

In cases where students come from a non-biomedical engineering background, the applications will be sent to the BME program to review and determine fit and/or pre-requisite/concurrent classes that the

applicant would need to take to qualify for the M.S. program in BME. Such applicants may receive conditional admission.

Apply Now (<https://gradapply.slu.edu/apply/>)

## Tuition

Tuition	Total Program Cost
MS Biomedical Engineering	\$42,000

Additional charges may apply. Other resources are listed below:

Information on Tuition and Fees (<https://catalog.slu.edu/academic-policies/student-financial-services/tuition/>)

Miscellaneous Fees (<https://catalog.slu.edu/academic-policies/student-financial-services/fees/>)

Information on Summer Tuition (<https://catalog.slu.edu/academic-policies/student-financial-services/tuition-summer-current/>)

## Financial Support

The School of Science and Engineering offers graduate fellowship awards and assistantships each year. Assistantships provide tuition, stipend and health insurance. There are also many opportunities for students to receive funding through external research grants that are managed by individual faculty.

For more information, visit the Office of Student Financial Services (<https://slu.edu/financial-aid/>).

## Learning Outcomes

1. Graduates will proficiently apply theories, methodologies and knowledge to address fundamental questions in their primary field of study.
2. Graduates will demonstrate the capability to critically assess scholarly works within the discipline and creatively synthesize broad areas of theory and scholarship to generate novel concepts and insights.
3. Students will demonstrate skills in oral and written communication, enabling them to effectively write technical documents and make technical presentations.

## Requirements

Code	Title	Credits
<b>Foundational Courses</b>		<b>6</b>
<i>Students select 6 credits from the following:</i>		
BME 5130	Medical Imaging	
BME 5360	Reaction Kinetics and Bioreactors for Biomedical Engineering	
BME 5410	Tissue Engineering	
BME 5600	Quantitative Physiology I	
BME 5650	Quantitative Physiology II	
BME 5400	Tissue-Material Interfaces	
BME 5210	Human Movement Biomechanics	
<b>Electives</b>		<b>15</b>
Students should select 15 credits with the Biomedical Engineering Graduate Elective attribute or additional courses from the Foundational Courses. (p. 3)		

## Choose the Non-Thesis or Thesis Option 9

### Thesis MS Option

Thesis MS students must take 9 additional credit hours: 6 credit hours of Thesis Research and 3 credit hours of required graduate classes

BME 5990 Thesis Research

BME 5010 Research Analysis

BME 5040 Technical Communication in the Discipline

### Non-Thesis MS Option

Non-Thesis MS students must take 9 additional credit hours of electives

**Total Credits 30**

## Continuation Standards

Students must maintain a cumulative grade point average (GPA) of 3.00 in all graduate/professional courses.

A grade of C for any class will require the student to retake the class and earn a grade of B or higher or take an equivalent class in its place, where the substitute class needs to be approved by the Graduate Program Coordinator. A student with a GPA below 3.0 or a grade of C in any class (even when the overall GPA is above 3.0) will be placed on academic probation. Students will be allowed 9 credit hours or 2 successive academic terms during which coursework registrations are recorded to return to good standing. Students will not be eligible to graduate while on academic probation.

## Non-Course Requirements

### Required Biomedical Engineering Seminar

The Biomedical Engineering Department offers a Graduate/Research seminar each fall and spring semester, which meets most weeks on Wednesdays at 3:30 PM. Graduate students are required to attend this seminar for both the fall and spring semesters of their first three semesters at SLU for all M.S. students. Students are permitted to miss at most two seminar sessions each semester.

### Program of Study Form

By the end of their first semester, each student should complete a Program of Study form listing the courses they plan to take to complete the requirements for their program. The form needs to be filed with the SSE Graduate Office and can be updated annually as needed.

### Thesis Option

Candidates for the Master of Science Research Thesis Option are required to pass an oral thesis proposal, which consists of both an oral presentation and a written proposal document. The written proposal must be submitted to the candidate's Guidance Committee at least two weeks prior to the oral proposal date. The written proposal should be a brief document including background and introduction, methods, preliminary data, proposed studies, and a timeline. The document should be a maximum of 10 pages, including references and figures. The oral thesis proposal includes a 20-40-minute seminar style presentation of the proposal to the candidate's guidance committee. A 2-hour block should be reserved for the proposal defense. Students should complete the form in consultation with their research advisor and submit it to the SSE Grad Office 2 weeks before the proposal date. The oral thesis proposal should be completed at least one complete semester before the expected graduation date.

Upon completion of the research, the students prepares a written thesis related to their research and must pass a final oral thesis defense, which

includes a public seminar style presentation on the research project. The time and location of the presentation must be publicized at least two weeks in advance so that it can be attended by all interested persons.

## Biomedical Engineering Graduate Elective attributed courses

Students are limited in how many Master’s Project, Co-op, Internship, and Independent Study credits can apply towards their degree. Students should check with their advisors when registering.

Code	Title	Credits
AENG 5230	Introduction to Computational Fluid Dynamics	3
BIOL 5080	Advanced Cell Biology	3
BIOL 5430	Advanced Principles of Virology	3
BIOL 5720	Advanced Cancer Biology	3
BME 5100	BioData Processing and Machine Learning	3
BME 5150	Brain Computer Interface	3
BME 5300	Biotransport	3
BME 5320	Drug Delivery	3
BME 5420	Tissue Engineering Scaffold Fabrication Techniques	3
BME 5430	Regenerative Engineering	3
BME 5455	Biomaterials Characterization and Instrumentation	3
BME 5850	Design of Biomedical Engineering Lab Experiments	3
BME 5910	Co-op with Industry	1-6
BME 5915	Internship with Industry	1-3
BME 5930	Special Topics	1-3
BME 5960	Master’s Project	1-3
BME 5970	Research Topics	1-3
BME 5980	Graduate Independent Study in Biomedical Engineering	1-3
BME 6000	Preparing Future Faculty	3
BME 6930	Special Topics	1-6
BME 6970	Advanced Research Topics in Biomedical Engineering	1-3
BME 6980	Graduate Independent Study in Biomedical Engineering	1-3
BST 5100	Introduction to General Linear Modeling	3
CHEM 5610	Biochemistry 1	3
CHEM 5630	Introduction to Chemical Biology and Biotechnology	3
ECE 5153	Image Processing	3
HDS 5210	Programming for Health Data Scientists	3
MENG 5820	Technology Entrepreneurship	3
PATH 5350	Intro to Microscopy Techniques	1-3
PUBH 5040	Generating Evidence from Public Health Data	3

## Roadmap

This roadmap is just one example of a semester-by-semester plan of study for this program. There are other plans students can and do take. The plan of study for each particular student is established in

consultation with each student’s academic advisor; *this roadmap does not replace academic advising appointments.*

Roadmap notes:

- This Roadmap assumes full-time enrollment unless otherwise noted.
- Courses/Milestones marked with an “!” are critical and must be completed in the semester listed in the Roadmap to ensure a timely graduation.
- Course availability and sequencing are subject to change.

## Non-thesis

Course	Title	Credits
<b>Year One</b>		
<b>Fall</b>		
BME Foundational class		3
BME Foundational or Elective class		3
BME Seminar		
<b>Credits</b>		<b>6</b>
<b>Spring</b>		
BME Foundational or Elective class		3
BME Electives		6
BME Seminar		
<b>Credits</b>		<b>9</b>
<b>Year Two</b>		
<b>Fall</b>		
BME Electives		9
<b>Credits</b>		<b>9</b>
<b>Spring</b>		
BME Electives		6
<b>Credits</b>		<b>6</b>
<b>Total Credits</b>		<b>30</b>

## Program Notes

Students can choose to take up to two classes (six credits) during the summer between years one and two. International students need to take a minimum of six credits per semester (spring and fall) to maintain a full-time student status.

## Thesis

Course	Title	Credits
<b>Year One</b>		
<b>Fall</b>		
BME Foundational class		3
BME Foundational or Elective class		3
BME 5000	Seminars	0
<b>Credits</b>		<b>6</b>
<b>Spring</b>		
BME Foundational or Elective class		3
BME Electives		3
BME 5010	Research Analysis	2
BME 5990	Thesis Research	1
BME 5000	Seminars	0
<b>Credits</b>		<b>9</b>

**Summer****Master's Thesis Proposal**

<b>Credits</b>	<b>0</b>
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**Year Two****Fall**

BME Electives	6
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BME 5990	Thesis Research	3
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BME 5000	Seminars	0
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<b>Credits</b>	<b>9</b>
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**Spring**

BME 5040	Technical Communication in the Discipline	1
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BME 5990	Thesis Research	5
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**Final Defense of the Master Thesis**

<b>Credits</b>	<b>6</b>
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<b>Total Credits</b>	<b>30</b>
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**Program Notes**

Students can choose to take up to two classes (six credits) during the summer between years one and two. International students need to take a minimum of six credits per semester (spring and fall) to maintain a full-time student status.

Students will start work on the thesis project in their first semester and dedicate the summer between years one and two to research.

**Contact Us**

For more information about any School of Science and Engineering graduate program, email [ssegrad-admissions@slu.edu](mailto:ssegrad-admissions@slu.edu).