

# MASTER OF SCIENCE (M.S.)

The M.S. and the Ph.D. in Biomedical Engineering are jointly offered between the Health Science Center and The University of Texas at San Antonio (UTSA). The primary objective of this program is to broadly train students in the principles of biomedical engineering so they are well prepared to participate in the development of new approaches for the diagnosis and treatment of human diseases.

As the program is multidisciplinary, the curriculum is designed to provide a synergistic combination of formal courses, seminars, teaching opportunities, interactions with clinicians, and individualized biomedical engineering research experiences in the laboratories of the biomedical engineering faculty. All students are required to take core courses in the areas of Biomaterials, Biomechanics, Bioelectronics/Imaging and Biology, Physiology, as well as Responsible Conduct of Patient-Oriented Clinical Research, and Experimental Design and Data Analysis. In addition to the basic core curriculum, students are required to take additional coursework in the area of specialization. Students have access to the bioengineering and biosciences laboratories at both the Health Science Center and UTSA. This provides a unique opportunity to have learning experiences in medical, dental, bioscience, and engineering environments.

## Biomedical Engineering Admissions Requirements

The minimum requirements for admission to the Master of Science degree in Biomedical Engineering program are described below. Note that admission is competitive and satisfying these requirements does not guarantee admission.

Applicants must have a grade point average of 3.0 or better in the last 60 semester credit hours of coursework with a major in a recognized science or engineering discipline. All students should have had sufficient background in engineering, chemistry, biology, and physics prior to being admitted to the program. It is expected that these students will have B.S. degrees with an emphasis in either engineering, physical science, or biological science disciplines. All students are required to have completed at least one year of engineering physics, chemistry, biology, and mathematics (up to Differential Equations I or Applied Engineering Analysis I). Students with deficiencies in the above courses will be required to satisfactorily complete selected courses as a condition of acceptance.

A satisfactory score, as evaluated by the Admissions Committee for Biomedical Engineering, is required on the Graduate Record Examination (GRE). Students whose native language is not English must achieve a minimum score of 550 on the Test of English as a Foreign Language (TOEFL) paper version or 79 on the Internet version. The applicant's performance on a standardized test will be considered in addition to other criteria for admission or competitive scholarship awards and will not be used as the sole criterion for consideration of an applicant.

Three letters of recommendation attesting to the applicant's readiness for graduate study.

A *complete* application includes the application form, official transcripts, letters of recommendation, GRE scores, a résumé, and a statement of the applicant's research experience, interests, and goals. TOEFL scores are required for those applicants whose native language is not English.

## Biomedical Engineering Degree Requirements

### Thesis Option

A minimum of 32.0 semester credit hours beyond the bachelor's degree and a minimum overall GPA of 3.0 is required for the M.S. degree in Biomedical Engineering thesis option. Undergraduate courses, general education courses, and prerequisites for graduate courses cannot be counted toward this total. For transferring students, course credit allowed for transfer will be decided on a case-by-case basis by the Biomedical Engineering Committee on Graduate Studies (COGS). If recommended by COGS, the request will then be submitted to the Dean of the Graduate School for approval. Regardless of their area of specialization, all students are required to take a total of 17.0 semester credit hours of Required Core Courses. In addition, all students must register for three semesters of Research seminar, a minimum of 6 semester credit hours of approved Elective Courses, and a minimum of 6 semester credit hours of biomedical engineering Master's Thesis Research. The courses taken by students are intended to focus and support the individual's mastery of his or her particular area of specialization. The student must successfully present their Thesis and be recommended by their program COGS for approval of their degree to the Dean of the Graduate School of Biomedical Sciences.

### Non-thesis Option

A non-thesis option is available upon approval from the Program Director and the Graduate Advisor of Record. Typically, a Master's degree (non-thesis option) plan of study will consist of at least 36.0 semester credit hours beyond the bachelor's degree. Undergraduate courses, general education courses, and prerequisites for graduate courses cannot be counted toward this total. For transferring students, course credit allowed for transfer will be decided on a case-by-case basis by the Biomedical Engineering Committee on Graduate Studies (COGS). If recommended by COGS, the request will then be submitted to the Dean of the Graduate School for approval. Regardless of their area of specialization, all students are required to take a total of 18.0 semester credit hours of Required Core Courses. In addition, all students must register for three semesters of Research seminar and a minimum of 15 semester credit hours of approved Elective courses.

## Biomedical Engineering Plans of Study

For the thesis option, a minimum of 32.0 semester credit hours is needed to obtain a Master of Science in Biomedical Engineering.

For the non-thesis option, a minimum of 36.0 semester credit hours is needed to obtain a Master of Science in Biomedical Engineering.

**\* Please note that courses with the prefix BME are taken at the University of Texas at San Antonio.**

### M.S., thesis option

#### First Year

Fall	Credit Hours
BIME 6004 Biology For Bioengineers	3
BIME 6090 or Seminar	1
BME 6011	
BME 6903	3

Elective(s)- see department	varies		<b>Second Year</b>		
			<b>Summer</b>		<b>Credit Hours</b>
Total Credit Hours:	7.0		BIME 6098 or Thesis BME 6986		1-12
<b>First Year</b>			BIME 6097, Research		1-12
<b>Spring</b>		<b>Credit Hours</b>	BME 7951, BME 7952, BME 2953, or or BME 7956		
TSCI 5070	Responsible Conduct Of Patient-Oriented Clinical Research	2			
BIME 6006	Human Physiology for Bioengineers	3			
BME 6803		3			
Elective(s)- see department	varies		<b>Third Year</b>		<b>Credit Hours</b>
Total Credit Hours:	8.0		<b>Fall</b>		
			BIME 6098 or Thesis BME 6986		1-12
<b>First Year</b>					
<b>Summer</b>		<b>Credit Hours</b>			1.0-12.0
BIME 6098 or Thesis BME 6986		1-12			
BIME 6097	Research	1-12			
Total Credit Hours:	2.0-24.0				
<b>Second Year</b>			<b>M.S., Non-thesis Option</b>		
<b>Fall</b>		<b>Credit Hours</b>	<b>First Year</b>		<b>Credit Hours</b>
BIME 6090	Seminar	1	<b>Fall</b>		
BIME 6097	Research	1-12	BME 6903		
BIME 6098 or Thesis BME 6986		1-12	BIME 6004	Biology For Bioengineers	3
BME 6703		3	BIME 6090 or Seminar BME 6001		1
BME 6033		3	Elective(s)- see department		varies
Elective(s)- see department	varies				
Total Credit Hours:	9.0-31.0		Total Credit Hours:		4.0
<b>Second Year</b>			<b>First Year</b>		<b>Credit Hours</b>
<b>Spring</b>		<b>Credit Hours</b>	<b>Spring</b>		
Elective(s)- see department	varies		TSCI 5070	Responsible Conduct Of Patient-Oriented Clinical Research	2
BIME 6097, Research BME 7951, BME 7952, BME 7953, or or BME 7956		1-12	BIME 6090 or Seminar BME 6001		1
BIME 6098 or Thesis BME 6986		1-12	BME 6803		3
Total Credit Hours:	2.0-24.0		Elective(s)- see department		varies
			Total Credit Hours:		6.0
			<b>First Year</b>		<b>Credit Hours</b>
			<b>Summer</b>		
			Elective(s)- see department		varies
			Total Credit Hours:		0.0

## Biomedical Engineering Objectives/ Program Outcomes

1. BME students will demonstrate their understanding of fundamental biology concepts for biomedical applications. Fundamental knowledge of biology is evaluated.
2. BME students will be able to design and carry out research experiments. Fundamental research skills are evaluated.
3. BME students will be able to communicate research findings to diverse audience.
4. BME students will demonstrate their understanding of biomaterials concepts. Fundamental biomaterials knowledge and the students' abilities to apply the knowledge of biomaterials are evaluated.
5. BME students will demonstrate their understanding of biomechanics concepts. Fundamental knowledge of biomechanics is evaluated.
6. BME students will conduct themselves in a professional and ethical manner in all biomedical engineering research.
7. BME students will critically evaluate scientific literature.

<b>Second Year Fall</b>	<b>Credit Hours</b>
BIME 6090 or Seminar BME 6001	1
BME 6703	3
BME 6033	3
Elective(s)- see department	varies
Total Credit Hours:	7.0

<b>Second Year Spring</b>	<b>Credit Hours</b>
BME 6961 (take during last semester)	1
Elective(s)- see department	varies
Total Credit Hours:	1.0

<b>Second Year Summer</b>	<b>Credit Hours</b>
Elective(s)- see department	varies
Total Credit Hours:	0.0

<b>Third Year Fall</b>	<b>Credit Hours</b>
BME 6961 (take during last semester)	1
Elective(s)- see department	varies
Total Credit Hours:	1.0

<b>Third Year Spring</b>	<b>Credit Hours</b>
BME 6961 (take during last semester)	1
Elective(s)- see department	varies
Total Credit Hours:	1.0