Biomedical Engineering

Degrees Offered	MSBME, PhD
Website	www.uab.edu/bme
Program Director	Prasanna Krishnamurthy, PhD
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Biomedical Engineering (BME) is the application of engineering principles and technology to the solution of problems in the life sciences and medicine. UAB is a top-25 institution for NIH funding, and BME graduate students have many opportunities to conduct cutting-edge multidisciplinary research. BME researchers enjoy collaborations across UAB's very active medical and dental schools as well as with researchers across the United States and beyond.

The BME Department offers Master of Science and PhD degrees. Students enrolled in UAB's MD/PhD or DMD/PhD programs may receive the PhD portion of their training in the Biomedical Engineering department. Students in any BME graduate program who are interested in the commercialization of biomedical technology are encouraged to complete the 15-hour Graduate Certificate in Translations of Biomedical Innovations to Clinical Practice Certificate offered by BME.

Admitted PhD students begin Fall term while MSBME students may be admitted for Fall or Spring. For full consideration, applications should be submitted by the priority deadline of January 15. Applications submitted as late as the UAB Graduate School's Fall deadline may be considered depending on the availability of positions.

International applicants must submit English proficiency scores in accordance with UAB Graduate School requirement. Click her for details: https://www.uab.edu/gradadmissions/apply/international-applicants

Students entering the MSBME program normally have earned a bachelor's degree in Biomedical Engineering, another engineering discipline, or a closely-related field. Students with undergraduate degrees in the physical sciences, life sciences, or mathematics will also be considered for admission; however, such students must demonstrate preparation for the BME graduate curriculum.

Admission to the MS program is competitive. Successful applicants typically have an undergraduate GPA of at least 3.5 (on a 4-point scale). However, applications are reviewed holistically and applicants with lower grades may be admitted based on factors such as strong research or professional experience. Scores on the GRE General Test are not required but are accepted.

UAB offers Accelerated Bachelor's / Master's and Early Acceptance. To learn more about these programs, including requirements and how to apply, visit the Graduate School's ALO page.

Accelerated Bachelor-Master's Program in Biomedical Engineering

Biomedical Engineering offers an accelerated Bachelor's / Master's (ABM) option for high-achieving undergraduate students pursuing a BS degree in Biomedical Engineering at UAB. A successful graduate of ABM will earn both a bachelor's degree and a master's degree in BME from the University of Alabama at Birmingham in an accelerated time-frame compared to completing the two degrees independently.

To be considered for the ABM program, students must:

- Have a UAB GPA of at least 3.5
- Have earned 60 or more undergraduate credit hours (36 of which must have been completed at UAB)
- Have junior-level standing and have completed at least 2 of the required junior-level BME courses
- Apply to the program through the normal UAB Graduate School application portal.

Applicants are expected to have already selected a research mentor for their graduate studies, typically continuing their undergraduate research. One of the letters of recommendation must come from the research mentor

Highlights of the ABM program:

- Students may pursue either the Plan I or Plan II MSBME option.
- Once enrolled in the program, students may take up to 12 credit hours of 500-level BME graduate courses that will count towards the MSBME degree.

Additional Academic Policies

Students must maintain an overall GPA of 3.00 to remain in good academic standing in the BME Graduate Program.

Special Topics (590/690/790) courses and Independent Study (591/691/791) courses are reviewed for degree applicability for each program in the School of Engineering. No more than 6 combined hours of Special Topics and/or Independent Study courses will be applied to the MSBME without appeal to and approval from the Program Director.

The School of Engineering offers similar courses at the 400/500 and 600/700 levels. While the higher numbered course has more advanced content, there is a significant overlap in topics. Therefore, students are not allowed to take a 500-level or 700-level course for credit if they have previously taken the related 400-level or 600-level course, respectively.

MSBME Plan I (Thesis Option)

The Plan I Master's degree requires completion of at least 30 semester hours of graduate work.

A Graduate Study Committee consisting of at least three faculty members should be formed. At least one committee member must have a primary appointment within BME and one must have a primary appointment outside of BME. A student is eligible for admission to candidacy after (1) a written thesis proposal has been orally presented to the committee and approved and (2) completion of Responsible Conduct of Research (RCR) training. Admission to candidacy must take place at least one semester before the student may graduate. A written thesis embodying the results of the student's original research must then be publicly defended, approved by the committee, and submitted to the Graduate School.

Upon completing a Plan I MSBME degree, a student may petition to continue their graduate training in the BME PhD program. This does not require a new application to the UAB Graduate School.

Master of Science in Biomedical Engineering

MSBME Plan I (Thesis Option) - 30 hours

Requirements		Hours
BME 617	Engineering Analysis	3
BME 655	NextGen BioMed-Research Technologies and Skills (Can be taken in place of BME 617)	
ME 661	Math Methods in EGR I (Can be taken in place of BME 617)	
BME 670	Quantitative Physiology	3
BST 621	Statistical Methods I	3
BME Elective 500-697		3
Life Science Elective at the 500+ level		3
BME/EGR/Math/Life Science Elective at the 500+ level [1]		3
BME 601	Seminar in Biomedical Engineering (Must be taken three times)	1
BME 601	Seminar in Biomedical Engineering	1
BME 601	Seminar in Biomedical Engineering [2]	1
BME 698	Non-Thesis Research [3]	3
BME 699	Thesis Research [4, 5]	6
Total Hours		**30**

1. Students in the Graduate Certificate in Technology Commercialization and Entrepreneurship program are encouraged to choose BMEM 601
2. One hour of BME 697 may substitute for one hour of BME 601
3. An additional 3 hour BME/EGR/Science Elective at the 500+ level may substitute
4. Responsible Conduct of Research (RCR) training plus in-person workshop must be completed before admission to candidacy
5. Course taken after admission to candidacy

MSBME Plan II (Non-Thesis Option) - 30 hours

The Plan II Master's degree requires completion of at least 30 semester hours of graduate-level work. It also requires completion of a research project and submission of a written project report that must be approved by the student's research advisor and submitted to the BME Graduate Program Director. Submission of the project report to the Graduate School is not required.

Requirements		Hours
BME 617	Engineering Analysis	3
BME 655	NextGen BioMed-Research Technologies and Skills (Can be taken in place of BME 617)	
ME 661	Math Methods in EGR I (Can be taken in place of BME 617)	
BME 670	Quantitative Physiology	3
BST 621	Statistical Methods I	3
BME Elective 500-697		3
BME/EGR/MA/Life Science Elective at the 500+ level [1]		9
Life Science 500+ level		3
BME 601	Seminar in Biomedical Engineering (Must be taken three times)	1
BME 601	Seminar in Biomedical Engineering	1
BME 601	Seminar in Biomedical Engineering [2]	1
BME 698	Non-Thesis Research [3]	3
Total Hours		**30**

1. Students in the Graduate Certificate in Technology Commercialization and Entrepreneurship program are encouraged to choose BMEM 601
2. One hour of BME 697 may substitute for one hour of BME 601
3. An additional 3 hour BME/EGR/Science Elective at the 500+ level may substitute

PhD Program

Students entering the doctoral program will possess a BS, MS, or be currently enrolled in the DMD/PhD or MD/PhD program at UAB.

PhD students normally have earned a bachelor's degree in Biomedical Engineering, another engineering discipline, or a closely-related field. Students with undergraduate degrees in the physical sciences, life sciences, or mathematics will also be considered for admission; however, such students must demonstrate preparation for the BME graduate curriculum.

Admission to the BME PhD program is competitive. Successful applicants have a 3.5 or greater GPA from their previous degree(s) (on a 4-point scale) and significant research experience. Scores on the GRE General Test are not required but are accepted.

Students admitted to the doctoral program typically receive a competitive stipend that includes payment of tuition.

In addition to completing coursework requirements (see below), doctoral students must form a Graduate Dissertation Committee consisting of at least five faculty members, including the primary research mentor. At least one committee member must have a primary BME appointment and two must have a primary appointment outside of BME. A written dissertation proposal must be orally presented to the committee and approved, at which time the student is admitted to candidacy. This must take place at least two semesters before the student may graduate. A written dissertation embodying the results of the student's original research must then be publicly defended, approved by the committee, and submitted to the Graduate School.

Publication Requirement. Original peer-reviewed research articles in reputable journals are the standard for demonstrating scientific productivity. The research conducted by BME doctoral students is expected to result in such publications. Before the degree is awarded, students are required to have at least one "first-author" journal article that has been published (or accepted for publication) and a second that has been submitted to a journal. Many students will be co-authors on collaborative research articles and may also share authorship on review articles, book chapters, conference proceedings, and other forms of scientific communication. Although these works bolster the student's scientific credentials, they do not count toward the BME publication requirement. In some cases, first-authorship of an article is shared among multiple individuals. In these cases, the article may count toward the publication requirement of only one BME doctoral student.

Additional Academic Policies

Students must maintain an overall GPA of 3.00 to remain in good academic standing in the BME Graduate Program.

Special Topics (590/690/790) courses and Independent Study (591/691/791) courses are reviewed for degree applicability for each program in the School of Engineering. No more than 6 combined hours of

Special Topics and/or Independent Study courses will be applied to the PhD without appeal to and approval from the Program Director.

The School of Engineering offers similar courses at the 400/500 and 600/700 levels. While the higher numbered course has more advanced content, there is a significant overlap in topics. Therefore, students are not allowed to take a 500-level or 700-level course for credit if they have previously taken the related 400-level or 600-level course, respectively.

Coursework for PhD After BS Degree

Students entering the PhD program with a BS degree are required to complete at least 72 semester hours of graduate work.

Requirements		Hours
BME 717	Engineering Analysis	3
BME 755	NextGen BioMed-Research Technologies and Skills (Can be taken in place of BME 717)	
ME 761	Math Methods in EGR I (Can be taken in place of BME 717)	
BME 770	Quantitative Physiology	3
BST 621	Statistical Methods I	3
GRD 717	Principles of Scientific Integrity	3
BME 773	Lab Rotation [1]	3
BME Elective 500+ level		6
BME/EGR/Science Elective 500+ level [2]		9
Life Science Elective 500+ level		
BME 701	Seminar in Biomedical Engineering [3]	6
BME 798	Non-Dissertation Research [4]	6
BME 799	Dissertation Research [5, 6]	24
Total Hours		**66**

1. If the lab rotation is not needed, student should substitute with an elective at the same or higher level with program director approval
2. Students in the Graduate Certificate in Technology Commercialization and Entrepreneurship program are encouraged to choose BMEM 601
3. Up to three hours of BME 797 may substitute for three hours of BME 701
4. BME/EGR/Science Electives at the 500+ level may substitute for this requirement
5. Responsible Conduct of Research (RCR) training + in-person workshop must be completed before admission to candidacy
6. Course taken after admission to candidacy

Coursework for PhD After MS Degree

Students entering the PhD program with an MS degree or those entering the PhD portion of the DMD/PhD or MD/PhD program are required to complete at least 51 additional semester hours of graduate work.

Requirements		Hours
BME 717	Engineering Analysis	3
BME 755	NextGen BioMed-Research Technologies and Skills (Can be taken in place of BME 717)	
ME 761	Math Methods in EGR I (Can be taken in place of BME 717)	
BME 770	Quantitative Physiology [1]	3
BST 621	Statistical Methods I [1]	3
GRD 717	Principles of Scientific Integrity [1]	3
BME 773	Lab Rotation [2]	3
BME Elective 500+ level [3]		3
BME Science Elective 500+ level		3
BME 701	Seminar in Biomedical Engineering [4]	3
BME 798	Non-Dissertation Research [5]	3
BME 799	Dissertation Research [6, 7, 8]	24
Total Hours		**51**

1. If these classes were taken as part of an MS degree at UAB, they may be substituted with BME/EGR/Science Electives (500+ level)
2. If the lab rotation is not needed, student should substitute with an elective at the same or higher level with program director approval
3. Students in the Graduate Certificate in Technology Commercialization and Entrepreneurship program are encouraged to choose BMEM 601
4. One hour of BME 797 may substitute for one hour of BME 701
5. BME/EGR/Science Electives at the 500+ level may substitute
6. Responsible Conduct of Research (RCR) training + in-person workshop must be completed before admission to candidacy
7. Course taken after admission to candidacy
8. Up to twelve hours may be substituted with BME 798 hours taken before candidacy; a minimum of twelve hours of BME 799 must be taken after admission to candidacy over at least two terms

Coursework for PhD, Bioinformatics Track after BS Degree

Requirements		Hours
Core Required Courses		
BME 717	Engineering Analysis	3
BME 755	NextGen BioMed-Research Technologies and Skills (Can be taken in place of BME 717)	
ME 761	Math Methods in EGR I (Can be taken in place of BME 717)	
BME 701	Seminar in Biomedical Engineering [1]	3
BME 770	Quantitative Physiology [2]	3
BME 773	Lab Rotation [3]	3
BST 621	Statistical Methods I [4]	3
GRD 717	Principles of Scientific Integrity	3
BME 799	Dissertation Research [5]	24
Required Bioinformatics Courses		
INFO 701	Introduction to Bioinformatics	3
INFO 702	Algorithms in Bioinformatics	3
INFO 703	Biological Data Management	3
INFO 704	Next-generation Sequencing Data Analysis	3
INFO 791	Bioinformatics Seminar I [6]	3
INFO 793	Bioinformatics Journal Club [7]	6
BME/EGR/Life Science Electives [8]		9
Total Hours		**72**

1. Students will register for BME 701 for at least 3 terms
2. Student may substitute with another GBS genetics or biology elective at the same or higher level with program director approval
3. If the lab rotation is not needed, student should substitute with an elective at the same or higher level with program director approval
4. Student may substitute with another biostatistics course at the same or higher level with program director approval
5. Dissertation research must be conducted after admission to candidacy and over at least 2 terms
6. Students will register for INFO 791 for at least 3 terms
7. Students will register for INFO 793 for at least 3 terms

[8] Electives must be approved by the program director prior to registration in order to be applied to the degree

Coursework for PhD, Bioinformatics Track after MS Degree

Requirements		Hours
Core Required Courses		
BME 717	Engineering Analysis	3
BME 755	NextGen BioMed-Research Technologies and Skills (Can be taken in place of BME 717)	
ME 761	Math Methods in EGR I (Can be taken in place of BME 717)	
BME 701	Seminar in Biomedical Engineering	1
GRD 717	Principles of Scientific Integrity	3
BME 799	Dissertation Research [1]	24
Required Bioinformatics Courses [2]		
INFO 701	Introduction to Bioinformatics	3
INFO 702	Algorithms in Bioinformatics	3
INFO 703	Biological Data Management	3
INFO 704	Next-generation Sequencing Data Analysis	3
INFO 791	Bioinformatics Seminar I [2]	3
INFO 793	Bioinformatics Journal Club	2
BME/Data Science Elective [4]		3
Total Hours		**51**

[1] Dissertation research must be conducted after admission to candidacy over at least 2 terms

[2] Students with post-graduate equivalence of the INFO courses, the program may allow substitution of up to 6 credits with BME/Data Science electives

[3] Students will register for INFO 791 for at least 3 terms

[4] Electives must be approved by the program director prior to registration in order to be applied to the degree