

# BIOENGINEERING, PHD

The first doctorate degree in bioengineering in the nation was awarded at Penn in 1953, and since that time, Penn Bioengineering has been an integral academic program linking faculty from the engineering, medical, and arts and sciences schools on a single centrally-located campus. Penn Bioengineering provides students with a flexible curriculum and a world-class research environment. Students are given the opportunity to work in a collaborative culture that includes multiple generations of leaders in academia, government, and industry. The careful process of matching students with faculty based on their research interests begins with first-year lab rotations, which gives students an opportunity to begin their dissertation research in their first semester.

**For more information:** <http://www.be.seas.upenn.edu/prospective-students/doctoral/index.php> (<http://www.be.seas.upenn.edu/prospective-students/doctoral/>)

View the University's Academic Rules for PhD Programs (<http://catalog.upenn.edu/pennbook/academic-rules-phd/>).

## Required Courses

Students are required to take at least 9 graduate level courses and 2 seminars.

Code	Title	Course Units
<b>Responsible Conduct of Research Requirement</b>		
EAS 9000	Responsible Conduct for Research in Engineering	
<b>Biomedical Science</b>		
Select courses in cell biology and/or systems physiology. Courses chosen in consultation with advisor. <sup>1</sup>		
<b>Bioengineering Fundamentals</b>		
Select three BE or Engineering courses devoted to analytical methods, modeling, experimental methods and data analysis which focus on the student concentration. Courses will be chosen in consultation with the advisor.		
<b>Research Discipline Electives</b>		
Select two courses chosen in consultation with advisor		
<b>Mathematics</b>		
Select two courses from the recommended list <sup>2</sup>		
<b>Bioengineering Research Rotation</b>		
<b>Bioengineering Seminar</b>		
Select a minimum of two BE 6990 seminars, usually in the first year.		

1

A list of courses that students have taken recently to fulfill this requirement (<http://www.be.seas.upenn.edu/current-students/masters/documents/16BiologicalScienceCourses.pdf>) can be found on the Bioengineering website.

2

Suggested courses include:

- ENM 5020 Numerical Methods and Modeling
- ENM 5100 Foundations of Engineering Mathematics - I
- ENM 5110 Foundations of Engineering Mathematics - II
- BE 5100 Biomechanics and Biotransport
- Additional math course recommendations (<http://www.be.seas.upenn.edu/current-students/masters/documents/16MathCourses.pdf>) can be found on the Bioengineering website.

The degree and major requirements displayed are intended as a guide for students entering in the Fall of 2022 and later. Students should consult with their academic program regarding final certifications and requirements for graduation.

## Sample Plan of Study

Code	Title	Course Units
<b>First Year</b>		
<i>Fall</i>		
Biomedical Science Course		
Math or BE Fundamentals Course <sup>1</sup>		
BE 6990	Bioengineering Seminar	
<i>Spring</i>		
BE 6990	Bioengineering Seminar	
Biomedical Science or BE Fundamentals <sup>1</sup>		
BE Fundamentals Course <sup>1</sup>		
<i>Summer</i>		
Qualification Evaluation <sup>2</sup>		
<b>Second Year</b>		
<i>Fall</i>		
BE 9990	Thesis/Dissertation Research	
Math Elective		
Biomedical Science or BE Fundamentals Course <sup>1</sup>		
<i>Spring</i>		
BE 6990	Bioengineering Seminar	
BE 9990	Thesis/Dissertation Research	
BE Fundamentals Course <sup>1</sup>		
Bioengineering Elective		
<b>Third Year and Beyond</b>		
BE Fundamentals Course <sup>1</sup>		
Dissertation Proposal <sup>3</sup>		
Final Exam and Dissertation Defense		

1

Selected in consultation with the research advisor.

2

Qualifications Evaluation will be completed during the Summer or Early Fall.

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3

The Dissertation Proposal is required by the end of the Fall semester in the Third Year.