

# BIOENGINEERING, PHD

for the degree of Doctor of Philosophy in Bioengineering

The Department of Bioengineering offers both a traditional doctoral program (for students with a previous master's degree) and a direct doctoral program (for students with only a bachelor's degree). Students in both programs are required to have a research advisor and competitive applicants are encouraged to review the research websites and publications of those bioengineering graduate program faculty (<https://bioengineering.illinois.edu/people/faculty/grad-program/>) they are most interested in working with.

Opportunity exists for specializing in i) computational science and engineering via the Computational Science & Engineering (<http://catalog.illinois.edu/graduate/engineering/concentration/computational-science-engineering/>) optional graduate concentration, and iv) data science and engineering via the Data Science & Engineering (<http://catalog.illinois.edu/graduate/engineering/concentration/data-science-engineering/>) optional graduate concentration.

## Department Research

Bioengineering faculty perform research in the areas of Bioimaging at Multi-Scale; Bio-Micro and Nanotechnology; Computational and Systems Biology; Molecular, Cellular, and Tissue Engineering; Neural Engineering; Research in BME Education; and Synthetic Bioengineering. In addition to Bioengineering faculty, the Department of Bioengineering has more than 50 affiliate faculty (<https://bioengineering.illinois.edu/people/faculty/grad-program/>).

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For additional details and requirements for all degrees, please refer to the department's Graduate Studies website (<http://bioengineering.illinois.edu/>) and the Graduate College Handbook (<http://grad.illinois.edu/gradhandbook/>).

### Entering with approved M.S. degree

Code	Title	Hours
<b>Professional Development</b>		<b>4</b>
BIOE 500	Graduate Seminar (two semesters)	2
BIOE 502	Bioengineering Professionalism	2
<b>Thesis Research</b>		<b>52</b>
BIOE 599	Thesis Research (min-max applied toward degree)	52
<b>Technical Elective Courses</b>		<b>8</b>
Selected in consultation with advisor		8
<b>Total Hours</b>		<b>64</b>

Other Requirements and Conditions

Requirement	Description
Other Requirements and Conditions may overlap	
Minimum program GPA:	3.0

A Masters degree is required for admission to the Ph.D. program.

Qualifying exam
Preliminary exam
Final exam and dissertation defense
Dissertation deposit

Entering with B.S. degree

Code	Title	Hours
<b>Professional Development</b>		<b>6</b>
BIOE 500	Graduate Seminar (four semesters)	4
BIOE 502	Bioengineering Professionalism	2
<b>Thesis Research</b>		<b>66</b>
BIOE 599	Thesis Research (min-max applied toward degree)	66
<b>Technical Elective Courses</b>		<b>12</b>
Selected in consultation with advisor		12
<b>Fundamental Courses</b>		<b>12</b>
Students must select one course from each of the three categories below		12
<b>Statistics and Data Science</b>		
BIOE 484	Statistical Analysis of Biomedical Images	4
BIOE 505	Computational Bioengineering	4
IB 501	Programming for Genomics	4
STAT 510	Mathematical Statistics	4
STAT 511	Advanced Mathematical Statistics	4
STAT 525	Topics in Computational Statistics	4
STAT 527	Advanced Regression Analysis	4
STAT 528	Advanced Regression Analysis II	4
STAT 530	Bioinformatics	4
STAT 533	Advanced Stochastic Processes	4
STAT 541	Advanced Predictive Analytics	4
STAT 542	Statistical Learning	4
STAT 543	Appl. Multivariate Statistics	4
STAT 545	Spatial Statistics	4
STAT 546	Machine Learning in Data Science	4
STAT 551	Theory of Probability I	4
STAT 552	Theory of Probability II	4
STAT 553	Probability and Measure I	4
STAT 554	Probability and Measure II	4
STAT 555	Applied Stochastic Processes	4
STAT 556	Advanced Time Series Analysis	4
STAT 558	Risk Modeling and Analysis	4
STAT 571	Multivariate Analysis	4
STAT 575	Large Sample Theory	4
STAT 576	Empirical Process Theory and Weak Convergence	4
STAT 578	Topics in Statistics	4
STAT 587	Hierarchical Linear Models	4
STAT 588	Covar Struct and Factor Models	4
<b>Engineering Math</b>		
BIOE 432	Systems Biology: Uncovering Design Principles of Biological Networks	3 or 4

BIOE 450	Introduction to Quantitative Pharmacology	3 or 4
BIOE 485	Computational Mathematics for Machine Learning and Imaging	4
BIOE 504	Analytical Methods in Bioeng	4
<b>Life Sciences</b>		
BIOE 430	Intro Synthetic Biology	4
BIOE 434	Immunoengineering	3 or 4
BIOE 487	Stem Cell Bioengineering	4
BIOE 526	Advances in Biotechnology	4
<b>Total Hours</b>		<b>96</b>

## Other Requirements and Conditions

Requirement	Description
Other Requirements and Conditions may overlap	
12 total hours from the Fundamental Courses and/or Technical Elective Courses categories must be BIOE-rubric courses.	
Minimum program GPA:	3.0
Qualifying exam	
Preliminary exam	
Final exam and dissertation defense	
Dissertation deposit	

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1. Ability to apply **quantitative** skills and **engineering principles** to propose novel and practical solutions to medical/human health problems.
2. Understanding of **professional** and **ethical** responsibilities.
3. Ability to **communicate** scientific problems and solutions, as well as their impact, effectively to a diverse audience and stakeholders, both orally and in writing.
4. Demonstrate moderate **technical** mastery in chosen research area, shown by the ability to identify an important scientific problem, formulate a hypothesis, and design experiments to conduct research and data analysis to test the hypothesis. The student should also be able to formulate alternatives.
5. Develop effective **leadership** skills in order to foster the ability to conduct **collaborative** research and work with a diverse team.

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## Admission Requirements

Applicants should have an undergraduate or graduate degree in a natural science, computer science, or engineering. A minimum grade point average of 3.00 (A = 4.00) for the last two years of undergraduate study is required. Applicants should show evidence of strong quantitative skills and of serious interest in the life sciences. GRE scores are optional.

## Financial Aid

Qualified students may apply for financial aid in the form of fellowships, teaching and research assistantships, and waivers of tuition and service fees. Starting in Fall 2020, Grainger Engineering PhD students in their first five years of enrollment who meet the minimum eligibility requirements (<https://grainger.illinois.edu/academics/graduate/phd-funding-guarantee/>) are guaranteed a funded appointment for fall and spring that includes a full tuition waiver, a partial fee waiver, and a stipend.

All applicants, regardless of US citizenship, whose native language is not English and who wish to be considered for teaching assistantships must demonstrate spoken English language proficiency (<http://grad.illinois.edu/admissions/taengprof.htm>) by achieving a minimum score of 24 on the speaking subsection of the TOEFL iBT or 8 on the speaking subsection of the IELTS. For students who are unable to take the TOEFL iBT or IELTS, a minimum score of 3 is required on the OEAi test (<https://linguistics.illinois.edu/testing/oeai/>), offered on campus. All new teaching assistants are required to participate in the Graduate Academy for College Teaching (<https://citl.illinois.edu/graduate-academy-college-teaching/>) conducted prior to the start of the semester.

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## Department of Bioengineering

Department Head: Mark Anastasio ([maa@illinois.edu](mailto:maa@illinois.edu))

Director of Graduate Studies: Wawrzyniec Dobrucki ([dobrucki@illinois.edu](mailto:dobrucki@illinois.edu))

Bioengineering website (<https://bioengineering.illinois.edu/>)

Program website (<https://bioengineering.illinois.edu/academics/graduate/PhD/>)

1240 Everitt Laboratory, 1406 W Green St, Urbana, IL 61801

(217) 300-8066

[bioe-gradprograms@illinois.edu](mailto:bioe-gradprograms@illinois.edu)

## Grainger College of Engineering

Grainger College of Engineering website (<https://grainger.illinois.edu/>)

## Admissions

Graduate Contact: Karin Readle ([kereadel@illinois.edu](mailto:kereadel@illinois.edu))

Department Admissions & Requirements (<https://bioengineering.illinois.edu/admissions/graduate/phd/>)

Graduate College Admissions & Requirements (<https://grad.illinois.edu/admissions/apply/>)