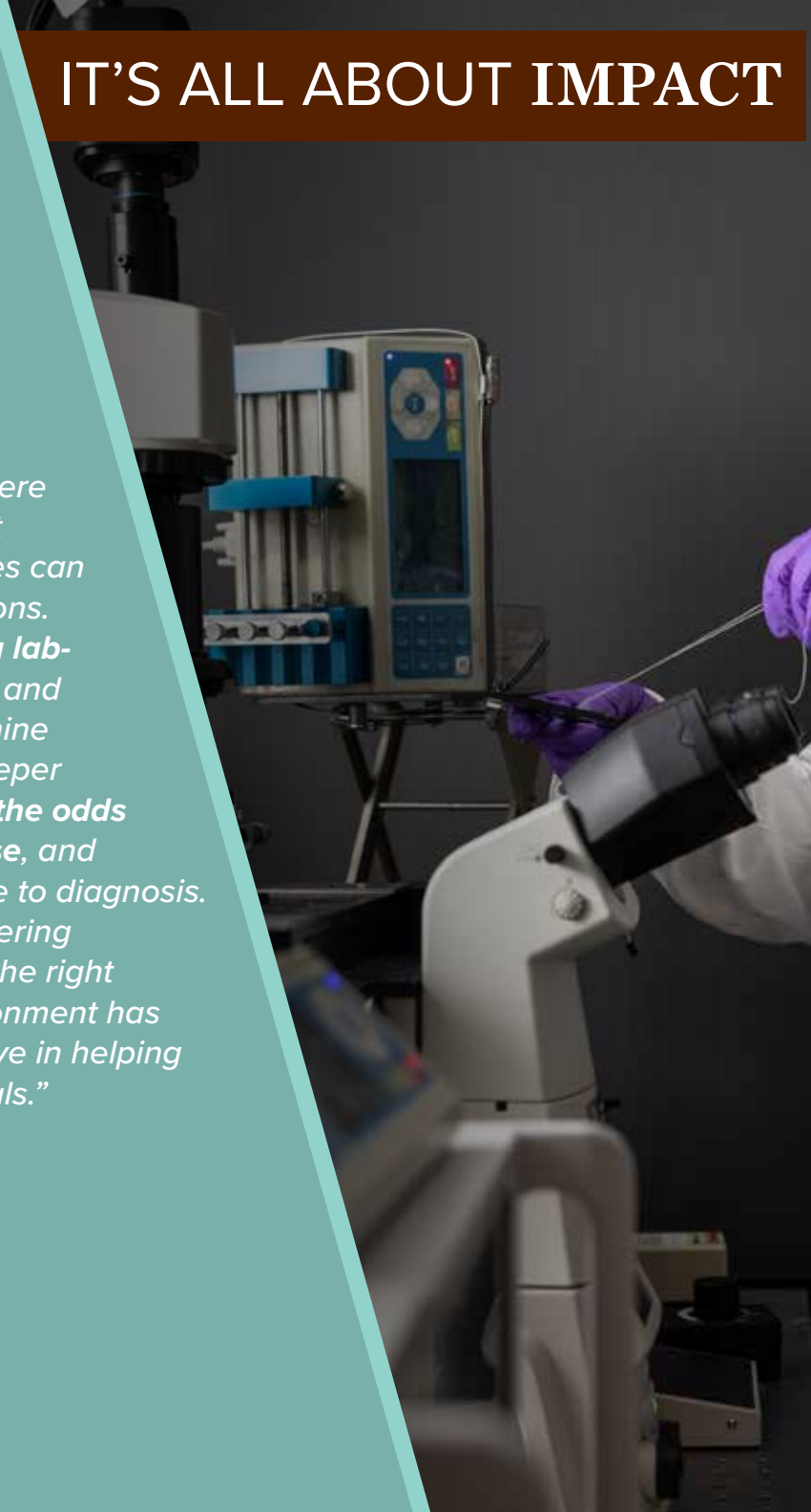
LEHIGH UNIVERSITY | P.C. Rossin College of Engineering and Applied Science

BIOENGINEERING

Graduate Degree Programs

IT'S ALL ABOUT **IMPACT**



"When cancer is diagnosed early, there are more treatment options, and families can make better decisions. We're ***developing a lab-on-a-chip platform*** *and incorporating machine learning to look deeper into cells,* ***improve the odds of detecting disease****, and shorten the timeline to diagnosis. Lehigh's Bioengineering department is just the right size, and the environment has been very supportive in helping me achieve my goals."*

Caroline Ferguson
PhD student

Lehigh Bioengineering—Where Engineering Innovation Impacts Health

Bioengineers advance human healthcare through the discovery and development of new technologies and affordable, personalized solutions.

Nanoscale structures. Large, complex, and interactive systems. Biocomputational modeling and machine learning. Innovative diagnostics and wearable technology. Bioengineering solutions drive development in the biopharmaceutical, biomedical, and health-related industries.

Lehigh University's graduate programs in bioengineering enable students to become innovators and leaders in the biomedical arena and prepare them to take on tomorrow's healthcare challenges. As a Lehigh bioengineer, you will engage in a robust technical curriculum and immerse yourself in research guided by our visionary, world-renowned academic faculty.

Our graduate students work across departmental boundaries to establish dynamic partnerships with industry, academic, and clinical partners, and dive into real-world experiences to advance their engineering problem-solving skills in biological and biomedical applications.

Lehigh BioE graduate programs

- **MS, Bioengineering (on campus/hybrid)**
- **PhD, Bioengineering**

IT'S ALL ABOUT **BALANCE**

Lehigh's Department of Bioengineering offers graduate students a vibrant, engaging setting for scholarship, advanced research, and professional growth. Faculty members go beyond "advising" to provide true, lasting academic mentoring. Through scholarly rigor and an entrepreneurial, collaborative mindset, we challenge and encourage our students to evolve into tomorrow's leaders in our field.

As educators, we value personal interaction and maintain a favorable student-to-faculty ratio, while providing access to significant research resources and an expansive network of internal and external partnerships that rivals those of far larger universities.

It is a balance that many institutions aspire to develop, but at Lehigh, it is in our DNA.

As a graduate student, you will learn from and work with internationally recognized faculty experts. Our diverse research portfolio includes projects such as bioprinted 3D-tissue scaffolds for cartilage regeneration, corona-virucidal functional polymers, computational modeling to explain molecular dynamics of coronavirus interactions, and machine learning techniques to detect rare circulating tumor cells.

Students thrive in our tight-knit community and find value in our network of successful alumni.

At Lehigh, we believe that the greatest potential for innovation occurs at the boundaries between strong disciplines. Whether working side-by-side with materials scientists and mechanical engineers; collaborating with molecular biologists, physicists, and chemical engineers; or troubleshooting with computer scientists, you will find yourself immersed in educational and research training experiences that integrate life sciences, physical sciences, and engineering, while emphasizing academic rigor and quantitative problem-solving for biomedical applications.

The department's research aligns with three principal thrusts:

Biocomputations and Modeling

From molecular modeling and bioinformatics at the biomolecular scale, through modeling of cells, tissues, and biofluids, to machine learning for personalized therapeutics and health informatics, computational and data sciences are revolutionizing bioengineering.

Areas of research include: BIOMOLECULAR MODELING, BIOINFORMATICS, BIOENGINEERING SYSTEMS & CONTROLS, BIOPHYSICS, MODELING OF BIOLOGICAL SYSTEMS, COMPUTATIONAL BIOENGINEERING, MACHINE LEARNING & ARTIFICIAL INTELLIGENCE, DATA ANALYTICS, BIOMEDICAL IMAGE ANALYSIS, DIGITAL HEALTH

Diagnostics, Sensors, and Devices

The development of diagnostic and sensing devices that help to identify, treat, and prevent disease are enabling advancement in biotechnology and reshaping the delivery of medical care.

Areas of research include: BIOMEDICAL IMAGING, BIOPHOTONICS, BIOMEMS, BIOSENSORS, MICROFLUIDICS, BIOELECTRONICS, MEDICAL DEVICES

IT'S ALL ABOUT **DISCOVERY**

Materials and Therapies

Many novel therapies are enabled by biomaterials innovation at the nano, molecular, and micro scales. Students work at the intersection of disciplines where Lehigh enjoys significant, demonstrable strength.

Areas of research include: BIOMATERIALS, NANOMATERIALS, NANOMEDICINE, DRUG DELIVERY, TISSUE ENGINEERING & REGENERATIVE MEDICINE, NEUROENGINEERING, BIOFLUID & SOLID MECHANICS, BIOMOLECULAR & CELLULAR MECHANICS, ENVIRONMENTAL BIOENGINEERING, WEARABLE DEVICES, DIGITAL THERAPEUTICS

Bioengineering research at Lehigh is funded by a wide array of public and private sponsors, including the National Institutes of Health, National Science Foundation, U.S. Department of Health and Human Services, U.S. Air Force, Commonwealth of Pennsylvania, American Heart Association, and Massachusetts General Hospital. Our research activities are supported by a wealth of core research facilities and collaborative resources, such as Lehigh's Health Research Hub (HRH) and the university's Interdisciplinary Research Institutes.

Lehigh's Interdisciplinary Research Institutes (IRIs) enable the university to solidify and further develop its strengths in key focus areas that resonate among our community of faculty, student researchers, and their external collaborators.

- **Institute for Cyber Physical Infrastructure and Energy (I-CPIE)**
- **Institute for Data, Intelligent Systems, and Computation (I-DISC)**
- **Institute for Functional Materials and Devices (I-FMD)**

For more, visit **lehigh.edu/iri**.

IT'S ALL ABOUT **LEADERSHIP**

Lehigh's distinguished bioengineering faculty pursue game-changing research while inspiring the next generation of innovators and thinkers in our field. About 25% of Lehigh BioE faculty have received prestigious awards, hold national or international board positions, and are elected Fellows of professional societies such as the American Society for Mechanical Engineers, American Institute of Biomedical Engineers, and the American Heart Association. Several hold multiple patent awards based on technologies stemming from their research. Professors lead, mentor, and encourage students to tackle tough questions, while providing access to state-of-the-art facilities for basic and translational biomedical research and cutting-edge scientific knowledge in a highly collaborative environment.

Juan Aceros
Assistive technologies, biomedical devices, rehabilitation engineering, neural prosthetics, materials characterization, micro/nano fabrication, MEMS

Yevgeny Berdichevsky
BioMEMS; neuroscience; microfluidic technology

Xuanhong Cheng
BioMEMS; microfluidics; point-of-care diagnostics; nanotechnology; biomaterials; surface sciences

Lesley W. Chow
Biomaterials design and synthesis; additive manufacturing; biodegradable polymers; tissue engineering; self-assembly; musculoskeletal tissues

Stephen P. DeWeerth
Neural networks; neural sensorimotor systems; bioelectronics/photonics; neural prosthetics; wearable robotic systems

Anand Jagota
Biomaterials; nanobiotechnology; biomechanics

Sabrina Jedlicka
Biointerface design; biomaterials; polymers; characterization; stem cell biology

Taneka Jones
Uterine tissue engineering, gynecological health, cell-matrix interactions

H. Daniel Ou-Yang
Experimental soft condensed matter physics

Tommy Pashuck
Biomaterials; tissue engineering; regenerative medicine; hydrogels; biodegradable polymers; peptides; nanofibers; enzyme responsive biomaterials

Tomas Gonzalez-Fernandez
Biomaterials; smart materials; 3D bioprinting; tissue engineering; regenerative medicine; stem cells; multicellular systems

Lori Herz
Pharmaceuticals; technology transfer; protein therapy; synthetic polymers

Niels Holten-Andersen
Biomaterials; biomolecular materials; biophysics; polymers

James Tsai-An Hsu
Bioseparation processes; aqueous two-phase polymer systems; chromatographic separations in industrial processing

Wonpil Im
Biomaterials; biophysics; computational bioengineering; modeling of biological systems; molecular bioengineering

Susan Perry
Neuronal cell biology; cell and tissue engineering; biomechanics; biomaterials

Anand Ramamurthi
Tissue engineering; tissue repair; biomimetic regeneration

Inês Seabra
High-pressure and supercritical fluid extraction; drug delivery systems

Dhruv Seshadri
Wearable technology, medical devices, bioelectronics, flexible electronics, biomaterials, digital health, digital therapeutics

Amirtahà Taebi
Cardiovascular engineering, wearables, mobile health, computational modeling and multiphysics simulation, digital twins, assistive technologies

Svetlana Tatic-Lucic
Bioelectronics/photonics; biosensors; bio-micro-electromechanical systems; micro- and nano- fabrication and manufacturing; sensors

IT'S ALL ABOUT **WHAT'S NEXT**

Lehigh's solid track record for graduate placement is a hallmark of our programs, with bioengineering alumni holding influential positions in leading companies across the country and around the world. Students who complete a master's degree at Lehigh are highly competitive applicants to higher degree programs, whether they remain on campus or attend other prominent universities. Lehigh's PhD program cultivates students' academic aspirations—with strong placement in faculty careers as well as intermediate postdoctoral positions at other prestigious institutions—and opens doors to specialized roles in industry and at national laboratories.

*"Our classes gave us an understanding of things like regulatory requirements and **product design and development** that are often overlooked in other master's degree programs. Lehigh did a really good job providing us with a **well-rounded sample of the skills we would need** to go into a lot of different fields."*

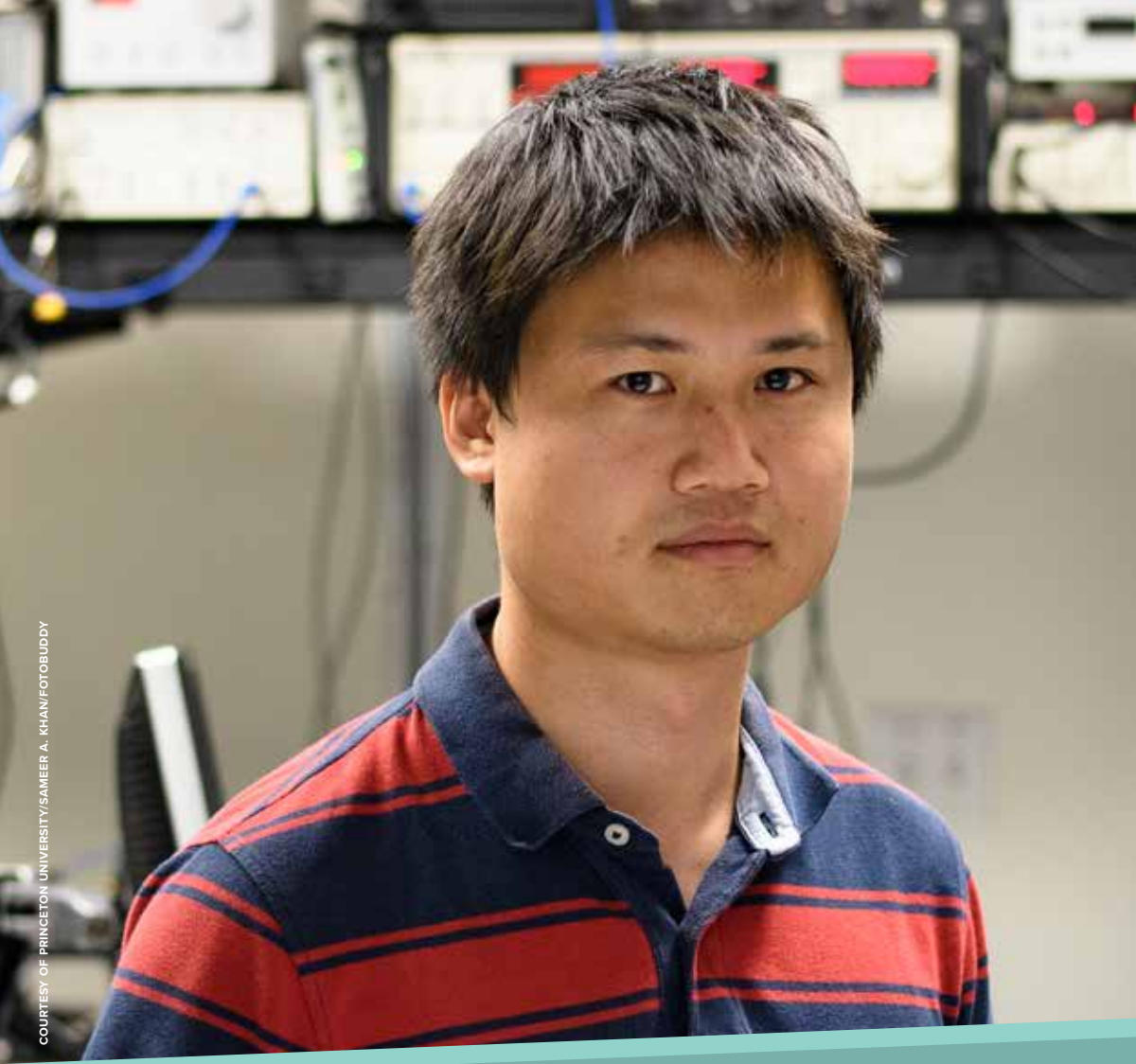
Megan Kozar, former Associate Scientist, Engineering, Johnson & Johnson; current medical student at Thomas Jefferson University

Alumni of Lehigh's graduate programs in bioengineering are making an impact at...

- **Abbott**
- **Aptitude**
- **Arthrex**
- **AstraZeneca**
- **B. Braun**
- **Boston Scientific**
- **Bristol Myers Squibb**
- **Evonik**
- **Ionis Pharmaceuticals**
- **King Mongkut's University of Technology**
- **Lilly**
- **Memorial Sloan Kettering Cancer Center**
- **MIT**
- **N-Side**
- **Novavax**
- **Princeton University**
- **Regeneron**
- **Sanofi**
- **Stryker**
- **Surgical Theater**
- **Syngen Biotech**
- **Talen Energy**

In roles such as...

- **Assay Development Specialist**
- **Assistant Professor**
- **Associate/Senior Scientist**
- **Biomedical Device Designer**
- **Cell Therapy Process Engineer**
- **Data Scientist**
- **Doctoral Student**
- **Entrepreneur**
- **Industrial Operations Engineer**
- **Lab Service Engineer**
- **Optimization Consultant**
- **Postdoctoral Fellow**
- **Process Development Engineer**
- **Quality Systems Engineer**
- **Research Associate/ Assistant**
- **Software Engineer**
- **Senior Reactor Operator**
- **Surgical Planning Engineer**
- **Systems Engineer**
- **Virtual Reality Engineer**



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*"Lehigh's engineering school is a **unique, interdisciplinary, cross-functional** space. It is just the right size and gave me the opportunity to work with PhD students and faculty members with **different specialties**, not only in the bioengineering department, but also in materials and mechanical engineering—and across the university in physics, chemistry, and biology. My experience taught me to **look at research problems from different angles** and trained me to communicate and work with people from different backgrounds."*

Dr. Ming-Tzo (Steven) Wei
Associate Principal Scientist
Cell Therapy Process Development
Cabaletta Bio

IT'S ALL ABOUT YOU

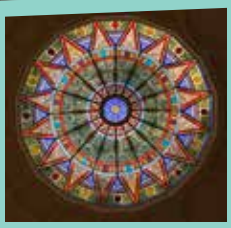
Outside of our classrooms and labs, Lehigh bioengineers are a collaborative, supportive, and driven cohort of future scholars and professionals who are fully engaged in the university's graduate student landscape, the campus at large, and our local community.

Opportunities for professional development are many, including a bioengineering student seminar series, research events featuring industry and clinical expert panels, and various networking and leadership-building activities.

Graduate students regularly present their research at local, national, and international conferences and workshops, and they are routinely recognized in these settings through competitive awards and travel grants.

Lehigh's Center for Career and Professional Development hosts events throughout the year to connect graduate students with the resources they need to achieve their career goals.

Recreational activities and learning programs offered by the Graduate Life Office enhance students' academic, personal, and professional development and build a sense of engagement, belonging, and community that transcends academic fields and engineering disciplines. Planned and spontaneous events include barbecues, birthday and cultural holiday celebrations, potluck dinners, pool parties, and graduate student formals.



Bethlehem and Pennsylvania's Lehigh Valley

Lehigh University is located in the heart of the beautiful Lehigh Valley, the third largest metropolitan area in Pennsylvania. Home to top-notch entertainment, shopping, and restaurants, our region is also known for its seemingly endless array of opportunities for outdoor exploration and adventure.

Bethlehem is a vibrant city, rich in history and known for its small-town friendliness and feel. The arts are alive here, with exciting seasonal events, nationally recognized musical acts, comedy, art, and more. Known as the "City of Festivals," Bethlehem hosts 20-plus major festivals and over 150 mini-festivals each year.

Need more action? Plan a day or weekend trip to New York City, Philadelphia, the Pocono Mountains, or the New Jersey and Delaware beaches—all within easy reach by car or public transportation.

MASTER'S STUDIES

Students in Lehigh's Master of Science program in Bioengineering build a customized curriculum that supports their academic needs and career goals. We offer three industry-relevant, career-focused tracks—Biomaterials, Bioengineering Product Development, and Biocomputations and Biomedical Analytics—as well as the option to pursue a more generalized MS. Students from a wide range of related STEM backgrounds engage in interdisciplinary coursework and immersive research and/or projects to build cross-disciplinary skills that expand career options. Students may matriculate in any semester and can complete the value-added BioE MS degree in Lehigh's resource-rich environment in a 12-month, three-term sequence (as outlined below), or over a four-term sequence to include in-depth thesis research or internship opportunities, or at a part-time pace that accommodates working professionals.

Fall

During this semester, core coursework will help you establish advanced foundational knowledge in bioengineering. You will also explore career options and set professional development goals. Students intending to engage in thesis research will begin detailed exploration of research opportunities, while those interested in real-world, experiential learning may begin exploring opportunities for one or two semester-long projects with faculty or industry partners.

Spring

This semester is all about customizing your degree with electives that will guide you in the direction of your career goals. Students may also explore research and/or project opportunities.

Summer

Your master's degree culminates this semester with coursework and project work that caps off a custom-tailored, advanced degree. Your advisor, your mentoring network, and Lehigh's professional development resources will support you as you pursue the next chapter in your professional growth and career.

Graduates consistently acknowledge the critical role a Lehigh master's degree plays in their successful advancement along technical and management career paths.

- **Degree completion in as little as 1 year**
- **Placement post-degree: 80%**
- **Average starting professional salary: $90,000**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Nitrile

PhD STUDIES

Doctoral students in bioengineering work alongside internationally recognized experts and enjoy a 3-to-1 student-to-faculty ratio that ensures personalized mentoring and close collaboration. All of our PhD students receive 100% funding of tuition and, each year, over half publish in a peer-reviewed publication and/or present at leading technical and professional conferences. PhD students in bioengineering come from a variety of backgrounds, including biomedical engineering, chemical engineering, electrical engineering, physics, mechanical engineering, materials science, biochemistry, and biology. Students work across disciplinary boundaries to establish dynamic partnerships with academic, industry, and clinical collaborators, and advance knowledge in the biomedical arena while preparing for careers that will impact human health.

Year 1

You will engage in core courses to build your foundation, identify and join a research group, partner with your advisor to tailor your academic program to meet your goals, and build technical skills critical to your career success.

Year 2

You will balance coursework and research and achieve your first programmatic milestone: the PhD qualifying exam. In the summer, you will fully engage in research and establish your doctoral committee.

Year 3

You will dive into dissertation development, prepare scientific publications and conference presentations, and achieve your second programmatic milestone with a formal presentation to your doctoral committee. Your summer may include an internship to expand career preparedness.

Year 4

As your momentum builds, you will continue to pursue research, scientific publication, and conference presentation goals. Achieve your third programmatic milestone: presenting your dissertation proposal to your doctoral committee. Summer may include an internship or exploration of career options.

Year 5

As you explore future postdoctoral opportunities, you will achieve your final programmatic research milestone: your formal dissertation defense.

The Department of Bioengineering provides a supportive environment that enables doctoral students to flourish. Over the course of your studies, you will develop the knowledge, skills, and perspective necessary for true research leadership—launching you into the next phase of your career.

- **Average time to complete degree: 4.8 years**
- **Placement post-degree: 85%**
- **Average starting professional salary: $118,000**

ADMISSIONS **INFO**

Application deadlines

Fall semester admission: December 15 (if applying for aid) or July 15 (all others)

All applications undergo a rigorous, holistic review. Decisions are based on multiple factors extending beyond simple benchmarks, including motivation for advanced study, tenacious pursuit of personal and technical goals, strong or strengthening academic record, and the desire and skill set to tackle challenging questions—whether in industrial practice, the academic research lab, or even the university classroom/lab—recognizing the continuum of prior opportunities available to our applicants.

Apply today!
Scan code or visit
engineering.lehigh.edu

Application guidelines

Prior degrees: Applicants must have earned a Bachelor of Science (BS) or a Master of Science (MS) in bioengineering or a related engineering discipline by the time of their matriculation. Applicants with degrees in related science fields (e.g., biology, chemistry, physics, computer science, biotechnology) are also welcome.

GRE not required: Neither unofficial nor official GRE scores are required. If submitted, scores will not be used in evaluating an application.

GPA benchmark: To be considered for admission, an applicant must have an undergraduate cumulative GPA of 3.0 or higher (4.0 scale) or a GPA of 3.0 or higher for the last two semesters of undergraduate studies or in a minimum of 12 hours of graduate work at other institutions. GPA standards for international institutions will be followed accordingly. Consideration will be given to a trend showing a strengthening of core GPA during final semesters of study.

Minimum course requirements: Two years of calculus (through differential equations), one year of physics, and sufficient background in biology (to be determined by the admissions committee) to serve as prerequisite for required graduate course in Advanced Biology.

TOEFL, IELTS, or Duolingo English Test (international students only): Official internet-based TOEFL, IELTS, or Duolingo English Test scores sent to Lehigh University from the testing agencies. If the applicant received a degree in the United States within the past two years, these test scores can be waived. All assessments are valid for only two years from the date the test was taken. *Individual "skill section score" recommendations for Lehigh University and the Internet-based TOEFL are:* Writing (20), Speaking (20), Reading (20), Listening (15), Composite score (79). *Individual "skill section score" recommendations for Lehigh University and the IELTS are:* Writing (6.0), Speaking (6.5), Reading (6.5), Listening (6.0), Overall score (6.5). *Recommended overall score for Lehigh University and the Duolingo English Test:* 125.

Complete applications also must include:

- **Candidate's resume** summarizing background relevant to graduate study, including (but not limited to) education/degrees (with GPA), class rank, relevant coursework, projects, research, scientific publications, relevant work experience, career goals, and extracurricular activities. The resume should be current, documenting experiences (in reverse chronological order) and all positions held up to and at the time of application.
- **Candidate's personal statement** detailing motivation for graduate study, research experience, specific research interests, and specific faculty of interest.
- **Complete transcripts** from each college and university attended. Unofficial copies may be uploaded by the candidate, but official transcripts from the prior institution's Registrar's Office must be submitted by candidates who accept offers of admission.
- **Letters of recommendation** – At least two (2) letters of recommendation submitted online directly by qualified individuals who are able to evaluate the applicant's academic achievements and potential for graduate studies. Preference is given to letters from research advisors and professors, but relevant letters from technical/industry employers who are able to speak to a candidate's potential for graduate study/research will also be accepted.
- **Application fee** of $50 (non-refundable)

Applicants who do not meet the above-mentioned requirements may be admitted at the department's discretion.


FOUNDER'S
WEEKEND
LEHIGH

engineering.lehigh.edu/bioe

To learn more, please contact:

Rossin College Graduate Programs
Lehigh University
engineering@lehigh.edu

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