BIOMEDICAL ENGINEERING, SCIENCE, AND HEALTH SYSTEMS AT DREXEL UNIVERSITY

GRADUATE STUDIES

The School of Biomedical Engineering, Science, and Health Systems is an internationally renowned center for research and instruction, ranked 42 among graduate Biomedical Engineering programs by *U.S. News & World Report*. As its name suggests, the school places a particular emphasis on collaboration among scientific disciplines. Students benefit from our alliances not just within the University but with other agencies, major research centers, universities, and businesses, including FDA, Fox Chase Center Research Institute, Children's Hospital of Philadelphia, Thomas Jefferson University, the University of Pennsylvania, Johnson & Johnson, Exponent, and Integra Life Sciences.

The school's multidisciplinary programs are built around a core curriculum with research opportunities in specialized areas. The core curriculum provides the technical and analytical training students need to apply their engineering skills or knowledge of the life sciences to current problems in biology and medicine. Various schools at Drexel, such as the College of Engineering and the School of Public Health, have designed courses relevant to graduate students in biomedical engineering and biomedical science. Through this cross-disciplinary approach students are able to acquire the advanced knowledge and skills necessary for graduate-level research and career specialization.

Programs

The School of Biomedical Engineering, Science, and Health Systems offers the following graduate programs:

- Biomedical Engineering (MS, PhD)
- Biomedical Science (MS, PhD)
- Articulation agreement with the Interdepartmental Medical Science Program at Drexel's College of Medicine (graduate pre-med)

Concentrations and specializations:

- Bioinformatics
- Biomaterials and Tissue Engineering
- Biomechanics and Human Performance Engineering
- Biomedical Systems and Imaging
- Biomedical Technology Development
- Neuroengineering

The following certificate programs are also available:

- Advanced Certificate in Bioinformatics
- Medical Product Design and Device Development

For More Information

In order to stay ahead of developments in the field, the school continuously reviews and updates the content of programs offered. Prospective students are encouraged to visit these websites for the most current information:

School of Biomedical Engineering, Science, and Health Systems:
www.biomed.drexel.edu

Admissions:
www.drexel.edu/grad/biomed

Graduate Catalog:
www.catalog.drexel.edu/graduate

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Our History

The School of Biomedical Engineering, Science, and Health Systems was established in 1961 as a freestanding university-level research institute offering master's and doctoral degrees. Believing that the marriage of technology and medicine would be the defining technological enterprise of the 21st century, the school's founders envisioned Drexel University and the Philadelphia region as a crucible of the biomedical industry, a vision that continues to be fulfilled. The school was reorganized in 1997, and enrolled its first undergraduate class the following fall.

Faculty

The school's faculty are at the forefront of research in a range of interdisciplinary fields. Faculty specialties include engineering, physics, mathematics, biostatistics, life science, clinical, and medicine. They work closely with students as educators and mentors, providing them the benefit of their connections to the local community as well as national and international biomedical engineering and science networks. All of the school's full-time faculty members hold the PhD.

Programs Offered

Master of Science (MS). Approximately 45 credits are required for the master's. A thesis is highly recommended, though a non-thesis option is also offered.

Doctor of Philosophy (PhD). To be awarded the PhD, students must complete 90 credits (credits earned toward a master's degree may apply toward the 90), fulfill a one-year residency requirement, pass the candidacy examination, and write and successfully defend a dissertation. The candidacy examination is intended to test the student's general knowledge of biomedical engineering and science. It assesses the student's level of preparation for pursuing the PhD.

Advanced Certificate. Professionals may also earn an advanced certificate in Bioinformatics or Medical Product Design and Device Development.

Biomedical Engineering (MS, PhD)

Biomedical engineering is concerned with the application of engineering and science methodologies to the analysis of biological and physiological problems and to the delivery of healthcare. Biomedical engineers utilize the analytical tools and broad physical knowledge of modern engineering and science, fundamental understanding of the biological or physiological system, and familiarity with recent technological breakthroughs to serve as an interface between the disciplines.

Those in the field may apply the patterns of living organisms to engineering design, or use the principles of engineering to create new approaches to human health. They may use their knowledge of physiological systems to reverse-engineer nature, creating, for example, artificial tissues and neural networks. Likewise, they may use their knowledge of engineering to create new equipment or environments for such purposes as maximizing human performance, accelerating wound healing, or providing noninvasive diagnostic tools.

Students in the Biomedical Engineering programs can choose to concentrate or specialize in one of six areas: bioinformatics, biomaterials and tissue engineering, biomechanics and human performance engineering, biomedical systems and imaging, biomedical technology development, or neurogengineering.

Biomedical Science (MS, PhD)

Biomedical science is a broad field concerned with the application of fundamental biological research and quantitative analysis to human health. The graduate program in biomedical science creates a systems approach to biomedical research and applications by integrating a range of scientific disciplines.

Students with an undergraduate education in basic life sciences (e.g., biology or biochemistry) or paramedical disciplines (e.g., nursing, physical therapy, or medical technology) add to those foundations with studies in quantitative analysis, mathematical modeling, fundamental computing skills, and informatics. For students entering with degrees in physics, mathematics, and/or computer science, the school, in close collaboration with the Department of Bioscience and Biotechnology, provides the coursework needed to acquire proficiency in the life sciences. All students in biomedical science achieve depth in the modeling of living systems and biomedical information processing and display. Students may choose to specialize in one of three concentrations: biomedical technology development, biomaterials and tissue engineering, or bioinformatics.

Students who graduate with a master's degree from the biomedical science program often continue clinical training in medicine, dentistry, or veterinary medicine; pursue further graduate study toward the PhD degree; or work in healthcare, pharmaceuticals, medical devices, biotechnology, and other industries. Students may also go on to professional studies in health law and business.

Articulation Agreement with the Interdepartmental Medical Science Program at Drexel's College of Medicine (IMS)

IMS is an interdisciplinary program designed for college graduates who wish to obtain the academic credentials required for medical school admission, are late in applying for their preferred term of entry, or would like to study in a medical school setting for a year before fully committing to a career path. It can also be of help to students interested in applying to dental, optometry, podiatry, or chiropractic schools. The program provides students with the opportunity to take actual first-year medical school courses presented through clinical, system-based modules.

Students who have maintained a GPA of at least 3.0 but choose not to enter medical school directly may continue on to earn a Master of Medical Science (MMS) with a second year of study. IMS also has an articulation agreement with the School of Biomedical Engineering, Science, and Health Systems in which students may instead obtain a Master of Science in Biomedical Science. This option involves additional coursework and/or a thesis. Additionally, students in this program may elect to pursue certificates of advanced study in select concentrations. Students apply to the IMS program through Drexel's College of Medicine.

Concentrations and Specializations

Bioinformatics. Emphasizes a systems engineering approach to provide a foundation in systems biology and pathology informatics. Provides students with hands-on experience in the application of large-scale information and in advanced computational methods used in systems biology.

Biomaterials and Tissue Engineering. Provides students with advanced training in cellular and molecular biology relevant to tissue engineering and behavior of materials used in biomedical applications.

Biomechanics and Human Performance Engineering. Familiarizes students with the responses of biological tissues to mechanical loads and the mechanical properties of living systems. Develops the skills needed to create working and living environments that improve human health and enhance performance. Also involves the study of orthopedic appliances and the broader aspect of rehabilitation engineering and management of disability.

Biomedical Systems and Imaging. Focuses on the theoretical and practical issues related to machine vision, image processing and analysis, and signal processing, as well as biomedical instrumentation and product development.

Biomedical Technology Development. Develops an understanding of critical regulatory, economic, and legal issues, as well as project management skills relevant to the development of new medical devices.

Neuroengineering. Includes the modeling of neural and endocrine systems, neural networks, complexity in physiological systems, evolutionary influences in biological control systems, neurocontrol, neurorobotics, and neuroprosthetics.

Certificates

Advanced Certificate in Bioinformatics. Emphasizes a systems engineering approach to provide a foundation in systems biology and pathology informatics and to train in the development of useful computational models of living systems and novel enabling informatics technologies in life sciences. The certificate requires six courses (23.5 credits) for completion.

Medical Product Design and Device Development. Designed to prepare biomedical engineers to understand the critical regulatory, economic, and legal issues, as well as project management skills required to facilitate the development of new medical devices and positive working relationships. The certificate requires five courses (15 credits) for completion.

Facilities and Resources

The School of Biomedical Engineering, Science, and Health Systems is located in Drexel's Bossone Research Enterprise Center, which houses state-of-the-art laboratories dedicated to research in biomedical systems, bionanotechnology, neuroengineering and drug delivery, and implant research. In addition, the school shares integrated cellular tissue engineering and regenerative medicine, imaging, and microwave photonics laboratories with several Drexel academic colleges and independent research institutes.

Drexel's proximity to several major medical centers, including Hahnemann University Hospital, Children's Hospital of Pennsylvania, Thomas Jefferson University, and the Hospital of the University of Pennsylvania, provides further opportunities for study and research.

Libraries

The Hagerty Library, located on the University City Campus, reflects the curricular strengths of the campus. It houses approximately 500,000 bound volumes, DVDs, videos, and archival resources; and provides access to an impressive array of electronic databases and periodicals.

Audiovisual materials are available for viewing and listening at home, in fully equipped study carrels, and in group viewing rooms. Scanners, printers, and software (including word processing, spreadsheet, and presentation programs) are available in the Computer Center. The Bookmark Café is open 24 hours a day for use by University students, faculty, staff, and residents.

Drexel University has three other libraries: Hahnemann Library, located on the Center City Campus, the College of Law Library, located on the University City Campus, and the Queen Lane Library, located on the Queen Lane Campus. Drexel graduate students also have access to the library resources of the University of Pennsylvania, the University of the Sciences in Philadelphia, and the Restaurant School at Walnut Hill College.

About Drexel

Drexel University is a private, nonsectarian coeducational university, founded in 1891 by financier and philanthropist Anthony J. Drexel. Today it is a top-tier, comprehensive research university, enrolling nearly 16,000 undergraduates and more than 9,000 graduate, professional, and certificate students on four separate campuses. The University's colleges and schools offer over 80 undergraduate majors, and more than 70 master's and 30 doctoral programs. Drexel is fully accredited by the Middle States Association of Colleges and Schools, with additional programs accredited by their respective top professional accreditation bodies. Students come from all 50 U.S. states and 133 foreign countries.

Philadelphia

Philadelphia is the nation's fifth largest city, with a metropolitan population of nearly six million. It is renowned for its historical sites and the diversity of its neighborhoods, and as a hub of the pharmaceutical, electronics, and finance industries.

The city offers countless arts, entertainment, and recreational attractions including museums, theaters, major league sports franchises, and one of the nation's largest urban park systems, as well as first-class shopping, dining, and nightlife.

The School of Biomedical Engineering, Science, and Health Systems is located on Drexel's University City Campus in Philadelphia's University City neighborhood, which is also home to the University of Pennsylvania, the University of the Sciences, and the Restaurant School at Walnut Hill College.

Admission

Acceptance for graduate study at Drexel University requires a bachelor's degree from an accredited institution in the United States or an equivalent international institution. Although admission requirements vary by program, consideration for admission typically requires a minimum grade point average (GPA) of 3.0 for the last two years of undergraduate work. The GPA for any graduate work must be at least 3.0. Applicants for post-master's status must show potential for further study by having maintained at least a 3.0 GPA in their master's-level studies. (Individual departmental requirements may exceed this minimum.)

The admissions committee evaluates all credentials submitted by applicants to determine a student's ability and potential to succeed in graduate study. In addition, the committee is interested in the applicant's ability to contribute to his/her program of study and to the University community as a whole.

Applicants may only apply to one program at a time. Drexel will waive the application fee if you apply online or submit your application during a campus visit. For more information, see **www.drexel.edu/grad/apply**.

Financing

Students must complete the Free Application for Federal Student Aid (FAFSA) to receive federal, state, or institutional aid. Students must complete this form annually to determine eligibility. File online at **www.fafsa.ed.gov**. Drexel's school code is 003256. To learn more, visit **www.drexel.edu/drexelcentral/finaid**.

Merit-based aid in the form of teaching, research, and graduate assistantships is awarded by the graduate departments based on need and availability of funds. Questions should be directed to the program coordinator.

Contact Us

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