

Biomedical Engineering

College of Engineering

The Department of Biomedical Engineering offers master's and doctoral degrees in addition to a minor in Biomedical Engineering. The graduate programs emphasize the application of engineering principles to the areas of medicine and biology and covers the broad aspects of mechanics, materials, fluids, optics, signal processing, systems analysis, instrumentation, physiology, cellular processes, and laboratory experimentation. Students in the program are provided with educational and research opportunities through the facilities and faculty of the Department and its ideal geographic location and close ties with other units of the University, ranging from engineering to basic science to clinical departments.

Areas of research include cardiac arrhythmia, cardiopulmonary control, magnetic resonance imaging, biomedical optics, orthopedic biomaterials and bone tissue engineering, and orthopedic biomechanics. The Department is housed in the centrally located Robotics and Manufacturing Building which makes it convenient for multidisciplinary research. Faculty and staff of the Department collaborate with investigators from other units of the University, including Anatomy & Neurobiology, Biochemistry, Biology, the Markey Cancer Center, Cardiovascular Medicine, Cardiothoracic Surgery, Center for Applied Energy Research, Chemical Engineering, Chemistry, Electrical Engineering, Mathematics, Mechanical Engineering, Neonatology, Nephrology, Neurosurgery, Oral Surgery, Orthopaedic Surgery, Otolaryngology, Pediatric Cardiology, Periodontics, Pharmacy, Physiology, and Plastic Surgery. Department faculty and staff provide opportunities and support for graduate students, medical residents, and selected undergraduates. Graduates of the program enter careers in research institutes, academia, hospitals, and the biomedical field.

Admission Requirements

Entering students are expected to have a baccalaureate degree in engineering. Some course work in the biological sciences is desirable but not required. Applicants with degrees purely in the physical or biological sciences may be required to complete select course work in the undergraduate engineering curriculum before being admitted to the graduate program. Admission to the biomedical engineering graduate program normally requires a GPA of at least 3.0/4.0 for all graduate and undergraduate work and Graduate Record Examination scores of ≥ 156 (Quantitative), ≥ 154 (Verbal) and ≥ 4.0 (Analytical). Additional application materials to be submitted to the Department include a statement describing your reasons for wanting to pursue graduate education in Biomedical Engineering and letters of recommendation from (3) faculty members who are familiar with your academic record. There is no specific form that is required for these letters. Satisfying the above requirements does not guarantee admission to the biomedical engineering graduate program.

Master of Science

The Master of Science degree provides students with a combination of experiences in basic research, design, development, and practical applications. The M.S. degree requires successful completion of the core curriculum (26 credit hours) plus an acceptable thesis. In special cases, a non-thesis option consisting of 31 credit hours is available for students with significant previous research or design experience or those who are concurrently employed in a biomedical engineering related industry. Enrollment in the non-thesis option requires approval of the Director of Graduate Studies and must be requested within the student's first 9 credit hours of graduate course work.

Core M.S. Curriculum

BME 530	Biomedical Instrumentation	(3)
BME 605	Biomedical Signal Processing	(3)
BME 661	Biomaterials Science and Engineering	(3)
BME 6XX	Biomechanics Elective	(3)
BME XXX	BME Technical Elective	(3)
BME 772	Seminar	(0)
BME 640	Ethics in BME and Science	(1)
PGY 412G	Principles of Human Physiology	(4)
	Math Elective	(3)
	Technical Elective	(3)

Professional Master of Biomedical Engineering

The Professional Master of Biomedical Engineering degree seeks to develop a unique combination of managerial, technical and leadership skills for those who will direct the future course of biomedical technology. The P.B.M.E. degree requires successful completion of 42 credits, including the capstone Advanced Study Project, and a summer internship.

Core P.B.M.E. Curriculum

BME XXX	BME Technical Electives	(9)
BME 642	Navigational Guides for Biomedical Product Designs	(2)
BME 766	Advanced Study Project	(3)
BME 772	Seminar	(0)
BME 777	Advanced Study Project	(3)
HA 601	Healthcare System Overview	(3)
HA 602	Strategic Planning and Management of Healthcare Organizations	(3)
HA 621	Quantitative Methods of Research	(3)
HA 637	Health Finance	(3)
MKT 600	Marketing Management	(3)
PA 623	Decision Analysis	(3)
PA 642	Public Organ Theory and Behavior	(3)
PGY 412G	Principles of Human Physiology	(4)

Doctor of Philosophy

The Doctor of Philosophy is a research degree granted on the basis of broad knowledge of engineering applications in biology and medicine and an in-depth study in a specific area leading to a dissertation reflecting original and independent work by the candidate. Applicants to the Ph.D. program are generally expected to have a master's degree. Under special circumstances, exceptional students may bypass the M.S. and be admitted directly to the Ph.D. program upon approval of the biomedical engineering faculty. Courses for advanced study are determined in consultation with an advisory committee and will be selected from the areas of engineering, mathematics, life sciences, and chemistry.

To earn a Ph.D. degree, students must:

1. Meet the requirements of the Graduate School.
2. Successfully complete PGY 502.
3. Pass the Qualifying Examination. This exam, consisting of written and oral components, is designed and administered by the student's Doctoral Advisory Committee.

4. Present and satisfactorily defend a dissertation documenting independent and comprehensive scholarship.

Further information about the graduate programs may be obtained by writing to the Director of Graduate Studies, Department of Biomedical Engineering, 522 RMB, 143 Graham Avenue, University of Kentucky, Lexington, KY 40506-0108, by e-mail at bmedgs@uky.edu, or by visiting our web site at <http://www.engr.uky.edu/cbme/future-students/programs/phd/>.

Graduate Courses

BME 481g	Topics in Biomedical Engineering (Subtitle Reflects Specialization)	(3)
BME 501	Foundations of Biomedical Engineering	(3)
BME 530	Biomedical Instrumentation	(3)
BME 579	Neural Engineering: Merging Engineering with Neuroscience (Same as EE 579)	(3)
BME 605	Biomedical Signal Processing I	(3)
BME 610	Biomedical Control Systems I	(3)
BME 615	Biomedical Signal Processing II	(3)
BME 620	Biomedical Control Systems II	(3)
BME 625	Analysis of Nonlinear Biomedical Systems	(3)
BME 630	Magnetic Resonance in Biomedicine	(3)
BME 635	Magnetic Resonance Instrumentation and Measurement	(3)
BME 641	Practices of Biomedical Engineering	(3)
BME 642	Navigational Guides for Biomedical Product Development	(3)
BME 661	Biomaterials Science and Engineering	(3)
BME 662	Tissue-Implant Interface	(3)
BME 670	Biomechanics I	(3)
BME 672	Musculoskeletal Biomechanics	(3)
BME 680	Advanced Topics in Biomechanics	(3)
BME 682	Advanced Topics in Orthopaedic Biomechanics	(3)
BME 685	Biofluid Mechanics	(3)
BME 690	Research in Biomedical Engineering (Subtitle Reflects Specialization)	(1-3)
BME 699	Special Topics in Biomedical Engineering (Subtitle Reflects Specialization)	(1-3)
BME 748	Master's Thesis Research	(0)
BME 749	Dissertation Research	(0)
BME 766	Management of Technology	(3)
BME 767	Dissertation Residency Credit	(2)
BME 768	Residence Credit for the Master's Degree	(1-6)
BME 769	Residence Credit for the Doctoral Degree	(0-12)
BME 772	Seminar	(0)
BME 774	Graduate BME Seminar	(0-1)
BME 781	Special Problems in Biomedical Engineering	(1-3)