

Biomedical Engineering, PhD

Requirements

The Doctor of Philosophy in biomedical engineering requires a minimum of 72 s.h. of graduate work, including acceptable transfer credit. Students who enter with an MS may count a maximum of 30 s.h. of approved graduate transfer credit toward the PhD, but they must earn at least 39 s.h. of graduate credit at the University of Iowa. Graduate transfer credit is approved by the Director of Graduate Studies.

Requirements	Hours
Engineering Ethics	1
Formal Coursework	30
Research	24
Elective Courses	17

Engineering Ethics

Students complete ENGR:7270 Engineering Ethics in their first semester.

Formal Coursework

The formal coursework requirement includes at least 6 s.h. in core courses and 24 s.h. in graded engineering coursework. All formal coursework must be taken on an A-F graded basis.

Students in the medical scientist training program (MSTP) complete 12 s.h. of the formal coursework requirement; the remaining 18 s.h. needed for this requirement will be completed through approved coursework taken for the MSTP. The core courses requirement that follows may vary for MSTP students. See Medical Scientist Training Program in the catalog.

Core Courses

Students are expected to complete the core courses during their first year of study.

Students may apply ME:5113 Mathematical Methods in Engineering to both the math requirement and the graded engineering courses requirement.

Core courses may be substituted by other equivalent courses at the discretion of the student's examining committee. Equivalent coursework taken as part of a student's undergraduate or graduate studies prior to starting the biomedical engineering graduate program at the University of Iowa may satisfy one or more of the core courses requirements. Students who wish to request a substitution must submit a course substitution or waiver form. Forms may be obtained from the graduate program coordinator.

Course #	Title	Hours
One of these human physiology courses:		
BME:3260	Quantitative Physiology	3
HHP:3550	Human Physiology With Laboratory	5

One of these math courses:

ME:5113/CBE:5140/ CEE:5513	Mathematical Methods in Engineering (strongly recommended)	3
MATH:3720	Introduction to Abstract Algebra	4
MATH:3770	Foundations of Analysis	4
MATH:3800/ CS:3700	Introduction to Numerical Methods	3
MATH:4050	Introduction to Discrete Mathematics	3
MATH:4250	Introduction to Financial Mathematics	3
MATH:4840	Mathematics of Machine Learning	3

Graded Engineering Courses

Students complete 24 s.h. in courses numbered 5000 or above in biomedical engineering (prefix BME), chemical and biochemical engineering (prefix CBE), civil and environmental engineering (prefix CEE), electrical and computer engineering (prefix ECE), industrial and systems engineering (prefix ISE), and mechanical engineering (prefix ME), with some exclusions.

Students may also select from the following courses numbered below 5000.

Course #	Title	Hours
BME:4310/ BMB:4310	Computational Biochemistry	3
CEE:4511/ME:4111	Scientific Computing and Machine Learning	3
CEE:4533/IGPI:4115	Finite Element I	3
ECE:3330/IGPI:3330	Introduction to Software Design	3
ISE:3400	Human Factors	3
ISE:3450	Ergonomics	3
ISE:4172	Big Data Analytics	3
ME:4080	Experimental Engineering	4
ME:4110/CEE:4515	Computer-Aided Engineering	3
ME:4111/CEE:4511	Scientific Computing and Machine Learning	3
ME:4112/CEE:4512	Engineering Design Optimization	3
ME:4117	Finite Element Analysis	3
ME:4140	Modern Robotics and Automation	3
ME:4150	Artificial Intelligence in Engineering	3
ME:4200	Modern Engineering Materials for Mechanical Design	3

The following courses may not be counted.

Course #	Title	Hours
Not from these:		
BME:5999	Research: Biomedical Engineering MS Thesis	arr.
BME:7999	Research: Biomedical Engineering PhD Dissertation	arr.
CBE:5100	Graduate Professional Development Seminar	1

CBE:5998	Individual Investigations: Chemical and Biochemical Engineering	arr.
CBE:5999	MS Thesis Research: Chemical and Biochemical Engineering	arr.
CBE:7999	Research: Chemical and Biochemical Engineering PhD Dissertation	arr.
ECE:5000	Graduate Seminar: Electrical and Computer Engineering	0
ECE:5998	Individual Investigations: Electrical and Computer Engineering	arr.
ECE:5999	Research: Electrical and Computer Engineering MS Thesis	arr.
ECE:7999	Research: Electrical and Computer Engineering PhD Thesis	arr.
ISE:5000	Graduate Seminar: Industrial Engineering	1
ISE:5998	Individual Investigations: Industrial Engineering	arr.
ISE:5999	Research: Industrial Engineering MS Thesis	arr.
ISE:7998	Special Topics in Industrial Engineering	arr.
ISE:7999	Research: Industrial Engineering PhD Dissertation	arr.
ME:6191	Graduate Seminar: Mechanical Engineering	1
ME:6198	Individual Investigations: Mechanical Engineering	arr.
ME:6199	Research: Mechanical Engineering MS Thesis	arr.
ME:7299	Research: Mechanical Engineering PhD Dissertation	arr.

PhD generally can be completed in three to four years beyond the master's degree.

Attendance and participation in seminars are mandatory and important parts of graduate education. All Biomedical Engineering graduate students are required to register for and attend the weekly seminar, BME:5010 Seminar in Biomedical Engineering. In the case of a conflict, (i.e., an internship out of town) a student may request to be excused from attending the seminar. Please note course conflicts do not qualify for a waiver. In the instance where a student feels they may have a qualifying conflict, the student must obtain approval from the Director of Graduate Studies and explain the rationale for the request.

Engineering Research

Students must complete at least 24 s.h. of research. This is primarily completed through enrollment in BME:7999 Research: Biomedical Engineering PhD Dissertation, but previous enrollments of BME:5999 Research: Biomedical Engineering MS Thesis may also count toward this requirement.

Additional enrollments in BME:7999 beyond the first 24 s.h. may apply toward elective credits.

Elective Courses

Elective courses must bring the total for the degree to 72 s.h. For many students, electives will primarily consist of additional enrollments in BME:7999. Students may also select from the courses listed in the preceding section titled "Graded Engineering Courses," or enrollments of BME:5010 Seminar in Biomedical Engineering.

Additional Requirements

After satisfactorily completing the comprehensive examination, students must complete and defend their dissertations at the final examination. Requirements for the