BIOMEDICAL ENGINEERING (BSBE)

Description

The Bachelor of Science in Biomedical Engineering (B.S.B.E.) degree program will prepare engineering students at the University of Mississippi to capably apply advanced mathematics, science, and engineering to solve the problems at the interface of engineering, biology, and medicine. Moreover, the curriculum will prepare graduates with the ability to make measurements on and interpret data from living systems, addressing the problems associated with the interaction between living and nonliving materials and systems.

The graduates of the program will be able to pursue

1. employment in biomedical or related industries
2. graduate studies in biomedical engineering or related disciplines, and
3. pursue professional careers in medicine, dentistry, pharmacy, or patent law.

Minimum Total Credit Hours: 126-127 depending on concentration

Degree Requirements

The academic regulations for this degree program, as entered in the University of Mississippi Catalog, are in effect for the current or selected academic year and semester. The University of Mississippi reserves the right to

1. change or withdraw courses;
2. change rules for registration, instruction, and graduation; and
3. change other regulations affecting the student body at any time.

General Education

Code	Title	Hours
Select one of the following First Year Writing I courses:		3
HONR 1010	Freshman Honors I	
WRIT 1000	Introduction to College Writing	
WRIT 1010	First-Year Writing I	
Select one of the following First Year Writing II courses:		3
WRIT 1020	First-Year Writing II	
LIBA 1020	First Year Seminar	
HONR 1020	Freshman Honors II	
Select six hours of humanities from the following:		6
AAST 2010	African American Experience I	
AAST 2020	African American Experience II	
Classics (CLSC)		
English (ENGL 2220-2226)		
ISOM 2010	Introduction to Gender Studies	
ISOM 2020	Introduction to Queer Studies	
History (HIST)		
LIBA 2020	Interdisciplinary Humanities	
LIBA 3050	Humanities and the Experience of War	
LIBA 3120	Advanced Interdisciplinary Humanities	
Philosophy (PHIL)		
Religion (RELG)		
Southern studies (SSTU 1000-level)		
HONR 1010	Freshman Honors I [1]	
HONR 1020	Freshman Honors II [1]	
Select three hours of Fine Arts from the following: [2]		3
Art History (ARTH)		
Music (MUSC)		
Dance (DANC)		
Theatre Arts (THEA)		
LIBA 1300	Introduction to the Fine Arts	
LIBA 2040	Interdisciplinary Arts	
LIBA 3140	Advanced Interdisciplinary Arts	
MUSC 1010	Introduction to Music Literature	
MUSC 1020	Fundamentals of Music Theory	
MUSC 1030	Introduction to Music	
MUSC 1040	Introduction to World Music Cultures	
MUSC 1050	Music Theory and Analysis I	
DANC 2000	Dance Appreciation	
THEA 2010	Appreciation of the Theatre	
THEA 2020	Introduction to Cinema	
Total Hours		**15**

[1] if not being used to fulfill composition requirements
[2] Studio and workshop courses cannot be used to satisfy this requirement.

General Education II

Code	Title	Hours
MATH 2611	Unified Calculus & Analytic Geometry I	3
MATH 2612	Unified Calculus & Analytic Geometry II	3
MATH 2613	Unified Calculus & Analytic Geometry III	3
MATH 2614	Unified Calculus & Analytic Geometry IV	3
MATH 3530	Elementary Differential Equations	3
BISC 1600	Biological Sciences I	3
BISC 1610	Biological Sciences I Laboratory	1
BISC 1620	Biological Sciences II	3
BISC 1630	Biological Sciences II Laboratory	1
CHEM 1050	General Chemistry I	3
CHEM 1051	General Chemistry Laboratory I	1
CHEM 1060	General Chemistry II	3
CHEM 1061	General Chemistry Laboratory II	1
CHEM 2210	Elementary Organic Chemistry I	3
CHEM 2211	Elementary Organic Chem. Laboratory I	1
PHYS 2110	Physics for Science & Engineering I	3
PHYS 2111	Lab Physics for Science & Engineering I	1
PHYS 2120	Physics for Science & Engineering II	3
PHYS 2121	Lab Physics for Science & Engineering II	1
Total Hours		**43**

Major Requirements

Code	Title	Hours
BMED 2000	Introduction to Biomedical Engineering	2
BMED 2220	Biomaterials	3
BMED 3050	Bioengineering Thermodynamics & Kinetics	3
BMED 3110	Biomechanics	3
BMED 3130	Physiology for Biomedical Engineering	3
BMED 3140	Biomedical Measurement	1
BMED 3150	Physiology for Biomedical Engineering II	3
BMED 3330	Biological Transport	3
BMED 4000	Biomedical Engineering Seminar	1
BMED 3700	Intro to Bioinformatics & Biostatistics	3
BMED 4440	Biomedical Systems and Controls	3
BMED 4611	Biomedical Engineering Senior Design I	2
BMED 4612	Biomedical Engineering Senior Design II	2
Total Hours		**32**

Major Requirements II

Code	Title	Hours
ENGR 1010 & ENGR 1110	Engineering Fundamentals and Engineering Fundamentals Lab	3
ENGR 3600	Electric Circuit Theory	3
Total Hours		**6**

Other Academic Requirements

Students in the Department of Biomedical Engineering who consider independent research as part of their educational experience may take an independent research course (up to 3 hours) in engineering. Additional opportunities for research in chemistry, biology, physics, or pharmacy may be approved with permission of the BME chair.

Concentration - Biomolecular

Biomolecular Engineering is an emerging discipline at the interface of molecular biology, biophysical chemistry, and chemical engineering — whose express purpose is developing novel molecular tools, materials, and approaches that are the focal point of applied and basic research within academia, industry, and medicine.

Code	Title	Hours
BMED 2560	Programming for Biomedical Engineering	3
BISC 3330	General Microbiology	4
BMED 5200	Biochemical Process Engineering	3
Select six hours of the following:		6
BMED 5100	Drug and Gene Delivery	
BMED 5220	Immunoengineering	
BMED 5230	Molecular and Cellular Biophysics	
BMED 5240	Microscopy for Engineers	
Select nine hours of biomolecular electives from the following:		9
BISC 3060	Virology	
BISC 3100	Human Anatomy	
BISC 3360	Genetics	
BISC 4400	Cell and Molecular Biology	
CHME 5350	Experimental Methods in Engineering	
CHME 5400	Coating Materials Process & Applications	
CHME 5430 & CHME 5000	Introduction to Polymer Science and Advanced Transport Phenomena I	
Any BME 3000+		
CHEM 2220 & CHEM 4710	Elementary Organic Chemistry II and Biochemistry I	
Select six hours of social sciences from the following:		6
Athropology (ANTH)		
Economics (ECON)		
LIBA 2030	Interdisciplinary Social Sciences	
LIBA 3130	Advanced Interdisc Social Science	
Political science (POLS)		
Psychology (PSYC)		
Sociology (SOCY)		
HONR 1010	Freshman Honors I	
HONR 1020	Freshman Honors II	
Total Hours		**31**

[1] if not being used to fulfill composition requirements

Other Academic Requirements

Students in the Department of Biomedical Engineering who consider independent research as part of their educational experience may take an independent research course for departmental credit (3000 level or higher, 3 hours) to count as an emphasis course. Additional opportunities for research in chemistry, biology, physics, or pharmacy may be approved with permission of the BME chair.

Concentration - Biodevices

Code	Title	Hours
BMED 2560	Programming for Biomedical Engineering	3
BMED 3010	Bioinstrumentation	3
BMED 3220	Sensors and Nanodevices in BME	3
BMED 4130	Biomedical Signal Processing	3
ENGR 3090	Statics	3
ENGR 3120	Mechanics of Materials	3
Select six hours of the following:		6
BMED 3530	Biodevices Design & Development	
BMED 4110	Tissue Mechanics	
BMED 5100	Drug and Gene Delivery	
BMED 5110	Computational Biomechanics	
BMED 5200	Biochemical Process Engineering	
BMED 5220	Immunoengineering	
BMED 5230	Molecular and Cellular Biophysics	
BMED 5240	Microscopy for Engineers	
MECH 3250	Intermediate Dynamics	
MECH 5410	Theory and Use of CAD and Solid Modeling	
MATH 3010	Discrete Mathematics	
MATH 3190	Introduction to Linear Algebra	
Select six hours of social sciences from the following:		6
Anthropology (ANTH)		
Economics (ECON)		

LIBA 2030	Interdisciplinary Social Sciences	
LIBA 3130	Advanced Interdisc Social Science	
Political science (POLS)		
Psychology (PSYC)		
Sociology (SOCY)		
HONR 1010	Freshman Honors I [1]	
HONR 1020	Freshman Honors II [1]	
Total Hours		**30**

[1] if not being used to fulfill composition requirements

Other Academic Requirements

Students in the Department of Biomedical Engineering who consider independent research as part of their educational experience may take an independent research course (3000 level or higher, 3 hours) to count as an emphasis course. Additional opportunities for research in chemistry, biology, physics, or pharmacy may be approved with permission of the BME chair.

Concentration - Bioinformatics

Code	Title	Hours
CSCI 1056	Programming in Python	3
BISC 3360	Genetics	4
CSCI 3043	Fundamentals of Data Science	3
CSCI 3075	Introduction to Database Systems	3
Select six hours of the following:		6
CSCI 3045	Information Storage and Retrieval	
CSCI 2056	Data Structures in Python	
CSCI 4043	Advanced Data Science	
CSCI 4044	Information Visualization	
CSCI 4047	Immersive Media	
CSCI 5047	Digital Image Processing	
Select six hours of 3000+ CSci or Engr courses		6
Select six hours of social sciences from the following:		6
Anthropology (ANTH)		
Economics (ECON)		
LIBA 2030	Interdisciplinary Social Sciences	
LIBA 3130	Advanced Interdisc Social Science	
Political science (POLS)		
Psychology (PSYC)		
Sociology (SOCY)		
HONR 1010	Freshman Honors I [1]	
HONR 1020	Freshman Honors II [1]	
Total Hours		**31**

[1] if not being used to fulfill composition requirements

Other Academic Requirements

Students in the Department of Biomedical Engineering who consider independent research as part of their educational experience may take an independent research course (up to 3 hours) in engineering. Additional opportunities for research in chemistry, biology, physics, or pharmacy may be approved with permission of the BME chair.

Concentration - Pre Med

Code	Title	Hours
BMED 2560	Programming for Biomedical Engineering	3
CHEM 2220 & CHEM 2221	Elementary Organic Chemistry II and Elementary Organic Chem. Laboratory II	4
CHEM 4710	Biochemistry I	3
BISC 3360	Genetics	4
BISC 4400	Cell and Molecular Biology	4
PSYC 2001	Introduction to Psychology	3
SOCY 1010	Introductory Sociology	3
Select six hours of the following:		6
BMED 5100	Drug and Gene Delivery	
BMED 5200	Biochemical Process Engineering	
BMED 5220	Immunoengineering	
BMED 5230	Molecular and Cellular Biophysics	
BMED 5240	Microscopy for Engineers	
Total Hours		**30**

Other Academic Requirements

Students in the Department of Biomedical Engineering who consider independent research as part of their educational experience may take an independent research course (up to 3 hours) in engineering. Additional opportunities for research in chemistry, biology, physics, or pharmacy may be approved with permission of the BME chair.

Program Educational Objectives

Following graduation and during the first several postgraduate years, biomedical engineering baccalaureate degree holders from the University of Mississippi will possess skill sets to accomplish the following:

1. Meet evolving expectations of future employers in the biomedical engineering workplace as well as other professional careers
2. Exhibit a systematic approach to problem solving in their professional practice including quantitative and analytical skills weighted with considerations towards a sustainable future.
3. Continue their professional development by pursuing advanced studies in medicine and other professional fields if desired.

Student Outcomes

Biomedical engineering students at the University of Mississippi should demonstrate the attainment of the following student outcomes:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. An ability to communicate effectively with a range of audiences
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies