BIOMEDICAL ENGINEERING, B.S. (B.S.B.M.E.)

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The Marshall University Bachelor of Science in Biomedical Engineering (B.S.B.M.E.) program objectives are as follows:

1. Graduates demonstrate technical and/or professional skills, which may include engineering problem-solving, scientific inquiry, and/or engineering design, to solve challenging problems in biomedical engineering and related fields.
2. Graduates are accomplished at communicating and working collaboratively in diverse work environments.
3. Graduates engaging in life-long learning activities at graduate, medical or other professional programs or workshops. Graduates entering professional careers find appropriate career progression and success.

The student learning outcomes of the B.S.B.M.E. are as follows:

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 judgments, 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.

Admission Requirements

- Meet Marshall University admission requirements
- Admission to the B.S.B.M.E. program requires a minimum composite ACT score of 21 with a math score of 24, or a minimum SAT composite of 750 with a math SAT of 580.
- Transfer students must have completed MTH 127 College Algebra-Expanded/MTH 130 College Algebra and MTH 132 Precalculus with Sci Applica.

Students not meeting the ACT/SAT score requirements above may enroll in Pre-Engineering. Requirements for Pre-Engineering are a minimum composite ACT score of 19 with a math score of 19-23, or a minimum SAT composite of 700 with a math SAT of 500-560. Students who are admitted to the Pre-Engineering program generally will require an additional calendar year to complete the requirements for the B.S.B.M.E. degree. Transfer students must be eligible to take MTH 127 College Algebra-Expanded/MTH 130 College Algebra, and MTH 132 Precalculus with Sci Applica.

Graduation Requirements

The B.S.B.M.E. degree program requires a minimum of 124 credit hours of coursework. In addition to fulfilling the university's requirements for graduation, B.S.B.M.E. students must maintain a minimum GPA of 2.0 in all professional courses. These professional courses include mathematics (MTH 229 Calculus/Analytic Geom I (CT) or above), required science courses, core engineering (ENGR) courses, biomedical engineering courses (BME), and courses used as technical electives. Entering students with a Math ACT of 24-26 are required to take MTH 132 Precalculus with Sci Applica. Such students will likely need an extra semester or summer term to satisfy B.S.B.M.E. requirements.

Admission Requirements

- Meet Marshall University admission requirements.
- Admission to the B.S.B.M.E. program requires a minimum composite ACT score of 21 with a math score of 24, or a minimum SAT composite of 1060 with a math SAT of 570. Transfer students must have completed MTH 127 College Algebra-Expanded/MTH 130 College Algebra and MTH 132 Precalculus with Sci Applica .

Students not meeting the ACT/SAT score requirements above may enroll in Pre-Engineering. Requirements for Pre-Engineering are a minimum composite ACT score of 19 with a math score of 19-23, or a minimum SAT composite of 990 with a math SAT of 510-560. Students who are admitted to the Pre-Engineering program generally will require an additional calendar year to complete the requirements for the B.S.B.M.E. degree. Transfer students must be eligible to take MTH 127 College Algebra-Expanded/MTH 130 College Algebra and MTH 132 Precalculus with Sci Applica.

Graduation Requirements

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 - General Education Course

 - Milestone course: a key success marker for your major. See your advisor to discuss the importance of this course in your plan of study.

The Core Curriculum is designed to foster critical thinking skills and introduce students to basic domains of thinking that transcend disciplines. The Core applies to all majors. Information on specific classes in the Core can be found at https://www.marshall.edu/gened/.

Course Requirements

Code	Title	Credit Hours
Core Curriculum		
Core 1: Critical Thinking		
FYS 100	First Yr Sem Critical Thinking	3
MTH 229	Calculus/Analytic Geom I (CT)	5
Critical Thinking Course		3
Core 2		
ENG 101	Beginning Composition	3
ENG 201	Advanced Composition	3
CMM 103	Fund Speech-Communication	3
MTH 229	Calculus/Analytic Geom I (CT)	5
BSC 120	Principles of Biology I	3
BSC 120L	Principles of Biology I Lab	1
Core II Humanities		3
Core II Social Science		3
Core II Fine Arts		3
Additional University Requirements		
Writing Intensive		3
Writing Intensive		3
Multicultural or International		3
BME 465	Biomedical Engr Capstone I	2
BME 466	Biomedical Engr Capstone II	2
Major-Specific		
Select one of the following:		5-10
MTH 132, Precalculus with Science Applications, and MTH 229, Calculus/Analytic Geometry I (CT)		
MTH 229	Calculus/Analytic Geom I (CT)	
MTH 230	Calculus/Analytic Geom II	4
MTH 231	Calculus/Analytic Geom III	4
MTH 335	Ordinary Diff Equations	3
BSC 120	Principles of Biology I	3
BSC 120L	Principles of Biology I Lab	1
BSC 121	Principles of Biology II	3
BSC 121L	Prin of Biology II Lab	1
BSC 227	Human Anatomy	3
BSC 227L	Human Anatomy Lab	1
BSC 228	Human Physiology	3
BSC 228L	Human Physiology Lab	1
CHM 211	Principles of Chemistry I	3
CHM 217	Principles of Chem Lab I	2
CHM 212	Principles Chemistry II	3
CHM 218	Principles of Chem Lab II	2
PHY 211	University Physics I	4
PHY 213	University Physics II	4
ENGR 102	Introduction to CAD	2
ENGR 104	The Engineering Profession	1
ENGR 111	Engineering Computations	3
ENGR 213	Statics	3
ENGR 214	Dynamics	3
ENGR 318	Fluid Mechanics	3
ME 245	Circuits and Instrumentation	3
BME 101	Intro to Biomedical Engr	1
BME 201	Biomedical Engineering Seminar	2
BME 302	Engineering Biomechanics	3
BME 305	Intro to Biophysical Measmnt	3
BME 306	Tissue Engineering	3
BME 310	Modeling & Simulation Bio Syst	3
BME 405	Mech & Performance Bio Mtrls	3
BME 460	Mechanics of Biofuilds	3
BME 465	Biomedical Engr Capstone I	2
BME 466	Biomedical Engr Capstone II	2
BME Technical Electives		*6*
Select two courses from the following:		9
Any BME 300- or 400-level course not already taken to satisfy degree requirements		
Any BSC 300- or 400-level course		
Any CHM 300- or 400-level course		
ENGR 222	Engr Cost Analysis & Economy	
ENGR 451	Intro to Proj Management	
ME 330	Manufacturing Methods/Design	
ENGR Elective		3
Any BME, CE, EE, ENGR, IE or ME (300- or 400-level) course not already taken to satisfy degree requirements		

Major Information

- Students are required to know and track their degree requirements for graduation or for entrance to a professional school.
- The B.S.B.M.E. degree program requires a minimum of 124 credit hours of coursework.
- Course offerings and course attributes are subject to change each semester. Please consult each semester's schedule of courses for availability and attributes.

- General Education Course

- Milestone course: a key success marker for your major. See your advisor to discuss the importance of this course in your plan of study.

Semester Plan

The Biomedical Engineering discipline is the application of engineering principles and design concepts to medicine and biology for health care purposes. This discipline aims to narrow the gap between engineering and medicine, combining the design and problem-solving skills of engineering with medical and biosciences to advance health care treatment, including diagnosis, monitoring, and therapy. Biomedical engineering has only recently emerged as its own study, compared to many other engineering fields. Biomedical engineering is a rapidly growing field, and Marshall University has a unique program that will highlight the technical strengths of the university and garner interest in the development of the biomedical industry in the state.

First Year

First Semester		Credit Hours
ENG 101	Beginning Composition	3
MTH 229	Calculus/Analytic Geom I (CT)	5
FYS 100	First Yr Sem Critical Thinking	3
ENGR 104	The Engineering Profession	1
BME 101	Intro to Biomedical Engr	1
BSC 227	Human Anatomy	3
BSC 227L	Human Anatomy Lab	1
UNI 100	Freshman First Class	1
	Credit Hours	**18**

Second Semester		
MTH 230	Calculus/Analytic Geom II	4
BSC 228	Human Physiology	3
BSC 228L	Human Physiology Lab	1
ENGR 111	Engineering Computations	3
BSC 120	Principles of Biology I	3
BSC 120L	Principles of Biology I Lab	1
ENGR 102	Introduction to CAD	2
	Credit Hours	**17**

Second Year

First Semester		
MTH 231	Calculus/Analytic Geom III	4
BME 201	Biomedical Engineering Seminar	2
CHM 211	Principles of Chemistry I	3
CHM 217	Principles of Chem Lab I	2
PHY 211	University Physics I	4
ENGR 213	Statics	3
	Credit Hours	**18**

Second Semester		
PHY 213	University Physics II	4
ENGR 214	Dynamics	3
BSC 121	Principles of Biology II	3
BSC 121L	Prin of Biology II Lab	1
CHM 212	Principles Chemistry II	3
CHM 218	Principles of Chem Lab II	2
	Credit Hours	**16**

Third Year

First Semester		
BME 305	Intro to Biophysical Measmnt	3
BME 302	Engineering Biomechanics	3
ME 245	Circuits and Instrumentation	3
ENGR 318	Fluid Mechanics	3
	Credit Hours	**12**

Second Semester		
ENG 201	Advanced Composition	3
BME 310	Modeling & Simulation Bio Syst	3
BME 306	Tissue Engineering	3
MTH 335	Ordinary Diff Equations	3
ENGR Elective		3
	Credit Hours	**15**

Fourth Year

First Semester		
BME 405	Mech & Performance Bio Mtrls	3
BME Technical Elective		3
BME 465	Biomedical Engr Capstone I	2
BME 460	Mechanics of Biofuilds	3
CMM 103	Fund Speech-Communication	3
	Credit Hours	**14**

Second Semester		
BME Technical Elective		3
Core II Social Science (MC/I, WI)		3
BME 466	Biomedical Engr Capstone II	2
Core II Humanities (WI, CT)		3
Core II Fine Arts		3
	Credit Hours	**14**
	Total Credit Hours	**124**