

# BS BIOMEDICAL ENGINEERING

## Program Learning 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 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 objective
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

Furthermore, our program prepares graduates with experience in:

- Applying principles of engineering, biology, human physiology, chemistry, calculus-based physics, mathematics (through differential equations) and statistics
- Solving bio/biomedical engineering problems, including those associated with the interaction between living and non-living systems
- Analyzing, modeling, designing, and realizing bio/biomedical engineering devices, systems, components, or processes
- Making measurements on and interpreting data from living systems

## Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (<https://catalog.calpoly.edu/generalrequirementsbachelorsdegree/#generaleducationtext>) section of this catalog, including:

- 60 units of upper-division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No Major or Support courses may be selected as credit/no credit.

### MAJOR COURSES

BMED 101	Introduction to the Biomedical Engineering Major	1
BMED 102	Introduction to Biomedical Engineering Analysis	1
BMED 212	Introduction to Biomedical Engineering Design	3

BMED 310	Biomedical Engineering Measurement and Analysis	4
BMED 410	Biomechanics	4
BMED 420	Principles of Biomaterials Design	4
BMED 425	Biomedical Engineering Transport	4
BMED 430	Biomedical Modeling and Simulation	2
BMED 440	Bioelectronics and Instrumentation	4
BMED 450	Contemporary Issues in Biomedical Engineering	4
BMED 455	Biomedical Engineering Design I <sup>1</sup>	4
BMED 456	Biomedical Engineering Design II: Senior Project <sup>1</sup>	4
BMED 460	Engineering Physiology	4
General Curriculum in BS Biomedical Engineering or Concentration		28-33

### SUPPORT COURSES

BIO 161	Introduction to Cell and Molecular Biology (B2 & B3) <sup>2</sup>	4
BIO 231 or BIO 232	Human Anatomy and Physiology I Human Anatomy and Physiology II	5
CE 204	Mechanics of Materials I <sup>3</sup>	3
CHEM 124	General Chemistry for Physical Science and Engineering I (B1) <sup>2</sup>	4
CHEM 125	General Chemistry for Physical Science and Engineering II	4
CSC 231	Programming for Engineering Students	2
EE 201	Electric Circuit Theory	3
ENGL 147	Writing Arguments about STEM (A3) <sup>2</sup>	4
MATE 210	Materials Engineering	3
MATH 141	Calculus I (B4) <sup>2</sup>	4
MATH 142	Calculus II (B4) <sup>2</sup>	4
MATH 143	Calculus III (Area B Electives) <sup>2</sup>	4
MATH 241	Calculus IV	4
MATH 244	Linear Analysis I	4
ME 211	Engineering Statics	3
ME 212	Engineering Dynamics	3
ME 302	Thermodynamics I	3
ME 341	Fluid Mechanics I	3
PHYS 141	General Physics I (Area B Electives) <sup>2</sup>	4
PHYS 142	General Physics II	4
PHYS 143	General Physics III	4
STAT 312	Statistical Methods for Engineers (Upper-Division B) <sup>2</sup>	4

### GENERAL EDUCATION (GE)

(See GE program requirements below.) 40

### FREE ELECTIVES

Free Electives 0

**Total units 191-196**

<sup>1</sup> ENGR 459, ENGR 460, ENGR 461 and BMED 400 (8); or ENGR 463, ENGR 464, ENGR 465, and BMED 400 (8) may substitute for BMED 455 and BMED 456 (8).

- <sup>2</sup> Required in Major or Support; also satisfies General Education (GE) requirement.
- <sup>3</sup> For students following the General Curriculum or Mechanical Design Concentration in BS Biomedical Engineering, CE 208 (5) may substitute for both CE 204 (3) and CE 207 (2).

## General Curriculum in BS Biomedical Engineering or Concentrations

- General Curriculum (<https://catalog.calpoly.edu/collegesandprograms/collegeofengineering/biomedicalengineering/bsbiomedicalengineering/generalcurriculum/>)
- Bioinstrumentation (<https://catalog.calpoly.edu/collegesandprograms/collegeofengineering/biomedicalengineering/bsbiomedicalengineering/bioinstrumentationconcentration/>)
- Mechanical Design (<https://catalog.calpoly.edu/collegesandprograms/collegeofengineering/biomedicalengineering/bsbiomedicalengineering/mechanicaldesignconcentration/>)

## General Education (GE) Requirements

- 72 units required, 32 of which are specified in Major and/or Support.
- If any of the remaining 40 units is used to satisfy a Major or Support requirement, additional units of Free Electives may be needed to complete the total units required for the degree.
- See the complete GE course listing (<https://catalog.calpoly.edu/generalrequirementsbachelorsdegree/#generaleducationtext>).
- A grade of C- or better is required in one course in each of the following GE Areas: A1 (Oral Communication), A2 (Written Communication), A3 (Critical Thinking), and B4 (Mathematics/Quantitative Reasoning).

Area A	English Language Communication and Critical Thinking	
A1	Oral Communication	4
A2	Written Communication	4
A3	Critical Thinking (4 units in Support) <sup>1</sup>	0
Area B	Scientific Inquiry and Quantitative Reasoning	
B1	Physical Science (4 units in Support) <sup>1</sup>	0
B2	Life Science (4 units in Support) <sup>1</sup>	0
B3	One lab taken with either a B1 or B2 course	
B4	Mathematics/Quantitative Reasoning (8 units in Support) <sup>1</sup>	0
Upper-Division B (4 units in Support) <sup>1</sup>		0
Area B Electives (8 units in Support) <sup>1</sup>		0
Area C	Arts and Humanities	
Lower-division courses in Area C must come from three different subject prefixes.		
C1	Arts: Arts, Cinema, Dance, Music, Theater	4
C2	Humanities: Literature, Philosophy, Languages other than English	4
Lower-Division C Elective - Select a course from either C1 or C2.		4
Upper-Division C		4

Area D	Social Sciences	
D1	American Institutions (Title 5, Section 40404 Requirement)	4
Area D Elective - Select either a lower-division D2 or upper-division D course.		4
Area E	Lifelong Learning and Self-Development	
Lower-Division E		4
Area F	Ethnic Studies	
F	Ethnic Studies	4
<b>Total units</b>		<b>40</b>

- <sup>1</sup> Required in Major or Support; also satisfies General Education (GE) requirement.