

2011-13 Cal Poly Catalog**Biomedical and General Engineering Department****MS BIOMEDICAL ENGINEERING****General Characteristics**

The Master of Science degree program in Biomedical Engineering is well-suited for those individuals who desire depth in engineering application to living systems, with a strong pragmatic and rigorous, hands-on educational experience. Graduates will be well-equipped to make significant contributions to the biomedical field. The MS in Biomedical Engineering program objectives are to:

- Provide graduates with a rigorous, broad-based advanced education in engineering coupled with applied biology that will prepare graduates for the many diverse career opportunities of biomedical engineering.
- Provide an empowering professional degree for students who intend to become practicing engineers
- Provide job-entry education for the more complex and evolving interdisciplinary area of biomedical engineering.
- Provide a base that enables graduates to maintain currency in their fields.
- Provide preparation for further study in engineering and/or medicine, leading to the Doctor of Engineering, MD, Ph.D, or MD/Ph.D. degrees.

Prerequisites

For admission as a classified graduate student, an applicant must possess a bachelor's degree in engineering or a closely related physical science with a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted. Applicants for graduate engineering programs are required to submit scores for the General Test of the Graduate Record Examination. Applicants are also required to submit 3 letters of reference in support of their application. A college level biology course, with laboratory, for biology majors is highly recommended. Applicants who meet these standards but lack prerequisite coursework may be admitted as conditionally classified students and must make up any deficiencies before advancement to candidacy. Applicants from other academic disciplines, such as biology or chemistry are encouraged to apply and may be admitted to the program conditionally in order to make up deficiencies in prerequisite coursework. Information regarding specific admission requirements and classification as a graduate student may be obtained from the Graduate Coordinator, Biomedical Engineering.

Program of Study

Graduate students must file formal study plans with their advisor, department, college, and university graduate studies office as well as fulfill the Graduation Writing Requirement no later than the end of the quarter in which the 12th unit of approved graduate course work is completed. The formal program of study must include a minimum of 45 units with:

- At least 23 units of the 45 unit program at the 500 level.
- A thesis or project as the mandatory culminating experience.

Curriculum for MS Biomedical Engineering

	<i>Units</i>
Required Courses	27
¹ BMED 460 Engineering Physiology (4)	
BMED 512 Biomedical Engineering Horizons (4)	
BMED 530 Biomaterials (4)	
BMED 550 Current and Evolving Topics in Biomedical Engineering (4)	
BMED 563 Biomedical Engineering Graduate Seminar (2)	
² BMED 599 Design Project (Thesis) (9)	
Approved Engineering, Science and Mathematics Electives	18
a) A minimum of 8 units from an advisor approved list of mathematics, statistics, biology, or analytic engineering courses, with at least 4 units at the 500 level. Typical courses could be, but are not limited to: BMED 404; CSC 448; IME 503; MATH 418, MATH 501, MATH 502; STAT 513.	
b) Remaining elective units are advisor approved. BMED 520 is required for non-BMED undergraduate majors.	

45

MS Biomedical Engineering, Specialization in STEM CELL RESEARCH

Characteristics. Prepares students for research careers working with stem cells. Graduates of the program are well-prepared to matriculate into stem-cell focused doctoral programs. Following completion of a PhD in a stem-cell focused program (and likely post-doctoral training), students would have job opportunities as principal investigators at universities/non-profit research institutes or as lead scientists at for profit institutions. Graduates are also well prepared for immediate employment as research specialists/laboratory managers at universities, research institutes, or private companies in the field of stem cells/regenerative medicine.

Culminating Experience. Students who obtain a degree in the Master of Science in Biomedical Engineering with a specialization in Stem Cell Research are not required to complete BMED 599. In place of the thesis as a culminating experience, students are required to complete a non-traditional Comprehensive Exam. This non-traditional Comprehensive Exam includes a 9-month internship in a stem cell research laboratory³ (BMED/ASCI/BIO 593), a

¹ BMED 460 is not required for BMED undergraduates as it is a core course in the major.

² BMED 591 and/or BMED 592 can substitute for up to 4 units of thesis. Recommended for BMED BS 4+1 students.

³ Students will complete their internship in stem cell research laboratories at UCSD, the Salk Institute, the Scripps Research Institute, Stanford University, or Novocell Inc.

quarter-long project course at Cal Poly (BMED/ASCI/BIO 594), a written report of their internship research, a written report of their quarter-long project course, and an oral presentation of their internship research. Through the completion of these components, students demonstrate their “ability to integrate the knowledge of the area, show critical and independent thinking, and demonstrate mastery of the subject matter.”

Required Courses	38
BMED 460 Engineering Physiology (4)	
BMED 510 Principles of Tissue Engineering (4)	
BMED 512 Biomedical Engineering Horizons (4)	
BMED 515 Introduction to Biomedical Imaging (4)	
BMED 545 Cell Transplantation and Biotherapeutics (4)	
BMED 563 Biomedical Engineering Graduate Seminar (2)	
BMED/ASCI/BIO 593 Stem Cell Research Internship (10)	
BMED/ASCI/BIO 594 Applications in Stem Cell Research (2)	
BIO 534 Principles of Stem Cell Biology (2)	
BIO 590 (1) and ASCI 581 (1) Stem Cell Research Seminars	
Approved engineering, science and mathematics electives	$\frac{7}{45}$