

2007-2009 Cal Poly Catalog

Updated Course Descriptions.

See catalog pages as printed for [original descriptions](#).

[Biomedical and General Engineering Department](#)

BMED—BIOMEDICAL ENGINEERING

BMED 111 Biomedical Engineering Calculations (3)

General introduction to bioengineering application of basic engineering science applied to topics in biomechanics, bioinstrumentation, biomaterials, biotechnology, and related areas. Application of the concepts and methods of science, mathematics and engineering to problems in biomedical engineering. 3 lectures. Corequisite: MATH 142 or consent of instructor.

BMED 212 Introduction to Biomedical Engineering Design (3)

General introduction to bioengineering design, including examples of engineering analysis and design applied to representative topics in biomechanics, bioinstrumentation, biomaterials, biotechnology, and related areas. Review of technological needs, design methodology, testing procedures, statistical analysis, governmental regulation, evaluation of costs and benefits, quality of life, and ethical issues. 2 lectures, 1 laboratory. Prerequisite: MATH 143 or consent of instructor.

BMED 310 Biomedical Engineering Management and Analysis (4)

Fundamentals of biomedical engineering analysis. Use and application of tools and analytical methods used by bioengineers. 3 lectures, 1 laboratory. Prerequisite: ME 211 or consent of instructor.

BMED 400 Special Problems for Advanced Undergraduates (2-4)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 8 units. Prerequisite: ME 212, junior standing and consent of department chair.

BMED 410 Biomechanics (4)

Introduction to physiological systems, with emphasis on structure and function of major tissues and organs. Application of mechanics to understand the behavior of these tissues and organs at gross and microscopic levels. Bioelastic solids. Rigid body biomechanics. Biofluids, basic mechanical properties of collagen and elastin, bone, cartilage, muscles, blood vessels, and other living tissues. Application of continuum mechanics to hard and soft tissues. Biomechanical engineering design for clinical applications. 3 lectures, 1 laboratory. Prerequisite: ME 212, BMED 310 or consent of instructor.

BMED 420 Principles of Biomaterials Design (4)

Fundamentals of materials science as applied to bioengineering design. Natural and synthetic polymeric materials. Materials characterization and design. Wound repair, blood clotting, foreign body response, transplantation biology, biocompatibility of materials, tissue engineering. Artificial organs and medical devices. Government regulations. Patenting. Ethical issues. 2 lectures, 2 laboratories. Prerequisite: ME 212, BMED 310 or consent of instructor.

BMED 425 Biomedical Engineering Transport (4)

Mass transfer in solids, liquids, and gases with application to biological systems. Free and facilitated diffusion. Convective mass transfer. Diffusion-reaction phenomena. Active transport. Biological mass transfer coefficients. Nonequilibrium thermodynamic analysis of transport phenomena. The osmotic effect. Diffusion and exchange in biological systems. 4 lectures. Prerequisite: ME 302, BMED 310 or consent of instructor.

BMED 430 Biomedical Modeling and Simulation (4)

Finite element methods for anatomical modeling and boundary value problems in the biomechanics of tissues and biomedical devices. Nonlinear biodynamics, heat flow, cardiac impulse propagation, anatomic modeling,

and biomechanics. 2 lectures, 2 laboratories. Prerequisite: BMED 420 or consent of instructor.

BMED 440 Bioelectronics and Instrumentation (4)

Analog and digital circuits in bioinstrumentation. Biomedical signals in continuous and discrete systems. Sampling and digital signal processing. Ultrasound, MRI, CT, Bioelectromagnetics. Electrokinetics. Biophysical phenomena, transducers, and electronics as related to the design of biomedical instrumentation. Potentiometric and amperometric signals and amplifiers. Biopotentials, membrane potentials, chemical sensors. Mechanical transducers for displacement, force and pressure. Temperature sensors. Flow sensors. Light-based instrumentation. Electrical safety. 3 lectures, 1 laboratory. Prerequisite: EE 201, BMED 310 or consent of instructor.

BMED 450 Contemporary Issues in Biomedical Engineering (4)

Current and evolving topics in biomedical engineering, including medical and industrial applications. Exploration of contemporary issues in biomedical engineering, including technical and societal implications. The Schedule of Classes will list topics selected. Total credit limited to 16 units. 4 lectures. Prerequisite: Senior standing in Biomedical Engineering.

BMED 455, 456 Biomedical Engineering Design I, II (4) (4)

Engineering design methodology, design process, project planning, decision making, modeling, construction, and testing of an open-ended design project. Preparation of formal engineering reports. Statistical analysis. Governmental regulations. Bioethical issues. 2 lectures, 2 laboratories. **BMED 455** prerequisite: BMED 410 or consent of instructor. **BMED 456** prerequisite: BMED 455 or consent of instructor. *Changed effective Winter 2009.*

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BMED 460 Engineering Physiology (4)

Physiology for biomedical engineering students, with an emphasis on control mechanisms and engineering principles. Engineering aspects of basic cell functions; biological control systems; muscle; neural; endocrine, and circulatory systems, digestive, respiratory, renal, and reproductive systems; regulation of metabolism, and defense mechanisms. 3 lectures, 1 laboratory. Prerequisite: ZOO 331 or equivalent, BMED 310 or consent of instructor.

BMED 481 Senior Project Design Laboratory I (2)

Selection and development of project by individuals or team which is typical of problems graduates must solve in their fields of employment or applied research. Project may involve, but is not limited to, physical modeling and testing of integrated design projects, costs, planning, scheduling and research. Formulation of outline, literature review, and project schedule. 2 laboratories. Prerequisite: MATH 244, IME 314, ME 302 or consent of instructor.

BMED 482 Senior Project Design Laboratory II (2)

Continuation of BMED 481. Completion of project by individuals or team which is typical of problems graduates must solve in their fields of employment or applied research. Project may involve, but is not limited to, physical modeling and testing of integrated design projects, costs, planning, scheduling and research. Formulation of outline, literature review, and project schedule. 2 laboratories. Prerequisite: BMED 481 or consent of instructor.

BMED 500 Individual Study (2-4)

Individual investigation, research, studies or surveys of selected problems. Advanced study planned and completed under the direction of faculty. Open to graduate students who have demonstrated the ability to do independent work. Total credit limited to 8 units. Prerequisite: Graduate standing and consent of department chair.

BMED 512 Biomedical Engineering Horizons (4)

Examination of the advances in nanotechnology, micro-electro-mechanical systems, materials and clinical technology. Relationship between modern medical achievements and advances in engineering and science, the biomedical engineering industry, and the use of technology in a human context. 4 lectures. Prerequisite: Graduate standing, MATH 143, CHEM 125, PHYS 131, BIO 161 or consent of instructor.

BMED 520 Introduction to Biomedical Engineering (4)

Advanced treatment of the basic engineering sciences in the biomedical engineering context. For the student who has had little prior exposure to

biomedical engineering, but has either a strong engineering or a strong science background. 4 lectures. Prerequisite: Graduate standing.

BMED 530 Biomaterials (4) (Also listed as MATE 530)

Structure-function relationships for materials in contact with biological systems. Interactions of materials implanted in the body. Histological and hematological considerations including foreign body responses, inflammation, carcinogenicity, thrombosis, hemolysis, immunogenic and toxic properties. Microbial interaction with material surfaces, degradation. 4 lectures. Prerequisite: BIO 213, ENGR 213, MATE 210 and graduate standing or consent of instructor.

BMED 550 Current and Evolving Topics in Biomedical Engineering (4)

Current topics in biomedical engineering, including medical and industrial applications. Exploration of detailed technical treatment of contemporary issues in biomedical engineering, and examination of technical and societal implications of these subjects. The Schedule of Classes will list topics selected. Total credit limited to 8 units. 4 lectures. Prerequisite: Graduate standing in biomedical engineering or consent of department chair.

BMED 563 Biomedical Engineering Graduate Seminar (2)

Selected topics of interest to biomedical engineering and other graduate students. Open to graduate students and selected seniors. A forum to share information about research and research tools; an opportunity to discuss topics of interest with professionals in the field, academics, and other graduate students. The Schedule of Classes will list topic selected. Total credit limited to 4 units. 1 seminar, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

BMED 591 Thesis Project Design Laboratory I (2)

Selection and development of project by individuals or team which is typical of problems graduates must solve in their fields of employment or applied research. Project may involve, but is not limited to, physical modeling and testing of integrated design projects, costs, planning, scheduling and research. Formulation of outline, literature review, and project schedule. 2 laboratories. Prerequisite: Graduate standing.

BMED 592 Thesis Project Design Laboratory II (2)

Continuation of BMED 591. Completion of project by individuals or team which is typical of problems graduates must solve in their fields of employment or applied research. Project may involve, but is not limited to, physical modeling and testing of integrated design projects, costs, planning, scheduling and research. Formulation of outline, literature review, and project schedule. 2 laboratories. Prerequisite: BMED 591 or consent of instructor.

BMED 599 Design Project (Thesis) (1-9)

Selection by individual or group, with faculty guidance and approval, of topic for independent research or investigation resulting in a thesis or project to be used to satisfy the degree requirement. An appropriate experimental or analytical thesis or project may be accepted. Total credit limited to 9 units. Prerequisite: Graduate standing.