2011-13 Cal Poly Catalog

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 270 Selected Topics (1–4)
Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Open to undergraduate students and 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: EE 201 and CSC 101 or CSC 234 or consent of instructor.

BMED 355 Electrical Engineering Concepts for Biomedical Engineering (4)
An introduction to electrical engineering concepts for biomedical engineers. Continuation of basic circuit analysis. Steady state AC circuit analysis and phasor concepts. Application of the Laplace Transform to transient circuit analysis. An introduction to digital logic gates, combinational and sequential logic circuits. 4 lectures. Prerequisite:EE 201, MATH 344.

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 404 Applied Finite Element Analysis (4)
Finite element based solutions to engineering problems with an emphasis on elastostatic problems in structural mechanics. The power and pitfalls associated with the finite element method highlighted through practical modeling assignments. Introduces the use of commercial finite element codes. 3 lectures, 1 laboratory. Prerequisite: ME 329 or CE 351 or BMED 410. Crosslisted as BMED/CHE/ME 404.

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, CE 204, BMED 310 or consent of instructor.

BMED 420 Principles of Biomaterials Design (4)

BMED 425 Biomedical Engineering Transport (4)

BMED 430 Biomedical Modeling and Simulation (2)
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. 1 lecture, 1 laboratory. Prerequisite: BMED 425 or consent of instructor.

BMED 440 Bioelectronics and Instrumentation (4)

BMED 445 Biopotential Instrumentation (4)
Focus on the principles associated with instrumentation used to detect surface biopotentials. Emphasis on circuit level design and laboratory implementation of systems used to detect ECG, EMG and EEG signals. Development of practical experience with analog electronic instrumentation used in the design and testing process. A system level design project related to surface biopotential detection and recording. 2 lectures, 2 laboratories. Prerequisite: BMED 440.

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 topic 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.

BMED 460 Biomedical 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 ZOO 332, and ENG 300, BMED 310 or graduate standing, or consent of instructor. Change effective Winter 2012.

BMED 470 Selected Advanced Topics (1–4)
Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

BMED 471 Selected Advanced Laboratory (1–4)
Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Prerequisite: Consent of instructor.

BMED 481 Senior Project Design Laboratory I (1)
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. 1 laboratory. Prerequisite: MATH 244, IME 314, ME 302 or consent of instructor.

BMED 482 Senior Project Design Laboratory II (1)
Continuation of BMED 481. Continuation 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. 1 laboratory. Prerequisite: BMED 481 or consent of instructor.