

BME180B BIOMEDICAL ENGINEERING DESIGN

(Required for BME)

Catalog Data: **BME180B Biomedical Engineering Design (Credit Units: 3)** Design strategies, techniques, tools, and protocols commonly encountered in biomedical engineering; clinical experience at the UCI Medical Center and Beckman Laser Institute; industrial design experience in group projects with local biomedical companies; ethics, economic analysis, marketing, and FDA product approval. Prerequisites: BME180A. BME 180B is the prerequisite for BME 180C. BME 180A-B-C must be taken in the same academic year. Open only to senior BME majors. In-progress grading. (Design Units: 3)

Textbook: King, P. H. and Fires, R. C., *Design of Biomedical Devices and Systems*. Marcel Dekker, 2002.

References: Lecture notes

Coordinator: Abraham P. Lee and William C. Tang

Relationship to Program Outcomes: This course relates to the Program Outcomes

BME: a, b, c, d, e, f, g, h, i, j, and k as stated at:

<http://undergraduate.eng.uci.edu/degreeprograms/biomedical/mission>

Course Outcomes / Performance Criteria: Students will:

Demonstrate leadership and teamwork skills in a project team environment. (BME d)

List and define the various steps in bringing a biomedical product from concept to market. (BME c)

Identify and assess challenges in each of the steps. (BME e)

Incorporate regulatory and ethical aspects in the team project. (BME f).

Articulate the impacts of the projects in a global, economic, environmental, and societal context. (BME h)

Design and conduct experiments to verify team project requirements. (BME b)

Use knowledge in mathematics, statistics, biological sciences, physical sciences, and engineering to solve the problems at the interface of engineering and biology whenever required. (BME k)

Use the appropriate computer tools to design, model, simulate, and/or operate the team project. (BME k)

Apply engineering principles and practices to meet the challenges. (BME k)

Demonstrate oral communication skills in presenting team projects. (BME g)

Demonstrate written communication skills in documenting team projects. (BME g)

Establish initial contacts with major, local, and national Biomedical Engineering companies. (BME i)

Demonstrate knowledge of contemporary issues related to biomedical engineering. (BME i)

Prerequisites By Topic: Understanding of fundamentals of biomedical device and system product design processes and hands on experience in classroom project teams.

Lecture Topics: Introduction to biomedical engineering from bench to market.
Fundamental product design tools.
Computer-Aided Design (CAD) tools.
Strategies and protocols in product development.
Coordination and leadership in product development team.
Design for quality, usability, manufacturability, reliability, and safety.
Food and Drug Administration approval process and regulatory issues.
Ethics and human factors in biomedical engineering.
Licensing, patents, copyrights, and trade secrets.
Market forecast and economic analysis.

Class Schedule: Meets for 3 hours of lecture each week for 10 weeks.

Computer Usage: Students will use Microsoft Projects for project planning and tracking, Cobalt for 3D solid design, Labview for programming device controls, MATLAB for solving homework problems, and Microsoft Word to prepare design reports.

Laboratory Projects: Students will work in teams to design a solution to a real world biomedical engineering problem:
Problem definition.
Team building/allocation of work.
Synthesis of concepts, design of solution.
Prototype fabrication.
Analysis.
Evaluation

Professional Component: Contributes toward the Biomedical Engineering Major Design experience.

Design Content Description

Approach: Students will use learned skills to design systems and devices for biomedical engineering. (30%) Specific discussions on system and device designs (30%). Team projects in design process flows. (40%)

Lectures: 60%

Laboratory Portion: 40%

Grading Criteria:

Homework assignments: 40%

First quarter project report: 60%

Estimated ABET Category Content:

Mathematics and Basic Science: 0 credit units or 0%

Engineering Science: 0 credit units or 0%

Engineering Design: 4 credit units or 100%

Prepared by: Abraham P. Lee & William C. Tang **Date:** July 2008

CEP Approved: Winter 2008