

BMED 2300 Problems in Biomedical Engineering II

Credit: 1-6-3

Prerequisite(s)

BMED 1300 (w/minimum grade of “C”) and 2210 (w/concurrency) and COE 2001 (w/concurrency)

Catalog Description

Biomedical engineering problems from industrial and clinical applications are addressed and solved in small groups using problem-based learning methodologies.

Textbook

Eggert, R.J. 2005. *Engineering Design*. Upper Saddle River, NJ: Prentice Hall.

Objectives

The overall objective for these courses is to introduce students to real-world design problems in biomedical engineering. Engineering design concepts, tools and methodologies are discussed in weekly lectures. Students are challenged through in several design problems to put these concepts and methodologies into practice. What they learn in this course is foundational to the design experiences in the curriculum they will encounter over the last half of their program of study.

Outcomes

Specifically at the end of the courses, students should be able to do the following things:

1. Explain the “big picture” of engineering design (Program Outcome 3)
 - a. Differentiate engineering analysis and design
 - b. Characterize design problems and the process used to solve them
 - c. Explain the relationship between the form and function of a product
2. Define and solve design problems (Program Outcome 3)
 - a. Characterize the different types of design problems
 - b. Decompose and diagram a product’s components
 - c. Select and apply design problem solution strategies
3. Formulate a design problem (Program Outcomes 3 and 6)
 - a. Describe the overall process of formulating a design problem
 - b. Determine customer and company requirements
 - c. Prepare and engineering design specification
 - d. Establish a consensus among members of a design team
4. Create concept designs (Program Outcome 3)
 - a. Distinguish alternative design concepts as different abstract embodiments of physical principles, material and geometry
 - b. Clarify the functional requirements of a design
 - c. Describe and apply function decomposition diagrams
 - d. Generate alternative design concepts using various methods
 - e. Evaluate concepts using weighted-rating method

5. Select appropriate materials (Program Outcome 3)
 - a. Explain the interdependency of product function, material, process and geometry
 - b. Describe fundamental material classes and properties
 - c. Establish criteria for screening materials
6. Build and test prototypes (Program Outcomes 2, 3 and 4)
 - a. Describe why companies build and test parts/products
 - b. Describe tests to validate form, fit and function
 - c. Characterize traditional and rapid prototyping processes
7. Design for failure, safety, tolerances, and environment (Program Outcome 3)
 - a. Identify product failure modes
 - b. Establish failure mode causes, likelihood and detectability
 - c. Describe and apply safety hierarchy fundamentals
 - d. Explain the differences between dimensions and tolerances
8. Consider human factors/ergonomics (Program Outcome 3)
 - a. Describe the human-machine system model
 - b. Specify human limitations for applying forces and torques
 - c. Specify size and range of motion limitations
 - d. Describe and apply three strategies for design for fit
9. Communicate solutions of problems (Program Outcome 5)
 - a. Written reports
 - b. Oral presentations