CATALOG DESCRIPTION

Students will learn the application of engineering concepts including statics, dynamics, optimization theory, composite beam theory, beam-on-elastic foundation theory, Hertz contact theory and materials behavior. Topics will include forces and moments acting on human joints; composition and mechanical behavior of orthopedic biomaterials; design/analysis of artificial joint, spine, and fracture fixation prostheses; musculoskeletal tissues including bone, cartilage, tendon, ligament, and muscle; osteoporosis and fracture-risk predication of bones; and bone adaptation. Students will be challenged in a MATLAB-based project to integrate the course material in an attempt to gain insight into contemporary design/analysis/problems. Also listed as Bioengineering C119.

COURSE PREREQUISITES

ME C85/CE C30 or Bio Eng 102; concurrent enrollment OK. Proficiency in MatLab or equivalent. Prior knowledge of biology or anatomy is not assumed.

TEXTBOOK(S) AND/OR OTHER REQUIRED MATERIAL


COURSE OBJECTIVES

The purpose of this course is twofold:

- to learn the fundamental concepts of orthopaedic biomechanics;
- to enhance skills in mechanical engineering and bioengineering by analyzing the mechanical behavior of various complex biomedical problems.

DESIRE...
prostheses, Design of hip prostheses, Beam-on-elastic-foundation theory, Contact stresses and wear, Design of knee prostheses, Fracture fixation and spinal implants, Bone adaptation and implant design.

CLASS/LABORATORY SCHEDULE

Three hours lecture, one hour discussion and computer workshop.

CONTRIBUTION OF THE COURSE TO MEETING THE PROFESSIONAL COMPONENT

Emphasis on interpretation of results from analytical and computational models, in light of economic, ethical and safety issues provides students with substantial professional component. Students are also required to write professional-type short reports summarizing their computational analyses.

RELATIONSHIP OF THE COURSE TO ABET PROGRAM OUTCOMES

An ability to apply knowledge of mathematics, science, and engineering. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. An ability to identify, formulate, and solve engineering problems. An ability to communicate effectively. A recognition of the need for, and an ability to engage in life-long learning. A knowledge of contemporary issues. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

ASSESSMENT OF STUDENT PROGRESS TOWARD COURSE OBJECTIVES

The students’ progress is assessed via Weekly homework, three Matlab assignments which involves computer programming, one Mid-term exam and a Final exam 40%

PERSON(S) WHO PREPARED THIS DESCRIPTION: