MECHANICAL ENGINEERING PROGRAM

ABET COURSE SYLLABUS

ME 402 Orthopedic Biomechanics (4 Units) Elective

Course Description: (2019-20 Catalog)	Biomechanical analysis of the musculoskeletal system. Emphasis on the use of statics, dynamics, strength of materials, viscoelasticity, and poroelasticity to analyze the mechanical loads acting on human joints, the mechanical properties of tissues, and the design of artificial joints. 3 lectures, 1 laboratory.
Prerequisite Courses:	ME 328.
Prerequisites by Topic:	Coverage of all topics presumes completion of basic courses in rigid body mechanics, strength of materials, and calculus.
Textbook: (and/or other required material)	Mechanics and Design in Musculoskeletal Systems, by Bartel, Davy, and Keaveny, Prentice-Hall, 2006.
References:	N/A
Course Coordinator/Instructor:	Stephen M. Klisch, ME Professor
Course Learning Outcomes:	1. Identify the physical anatomy, structure, and biomechanical function of the human musculoskeletal system. 2. Apply statics and dynamics to analyze and predict the forces and moments that act on human joints. 3. Determine mechanical properties of biological tissues from experimental data and explain structure-function relations. 4. Apply strength of materials techniques such as composite beam theory to design artificial joints. 5. Apply advanced material models to calculate mechanical properties of biological tissues.
Relationship of Course to Mechanical Engineering Student Outcomes:	SO 1: Developed (D) SO 2: Developed (D) SO 3: Developed (D) SO 4: Introduced (I) SO 5: Developed (D) SO 6: Mastered (M) SO 7: Mastered (M)

Topics Covered:	Introduction & Anatomy (1 lectures) Rigid Body Biomechanics (5 lectures) Strength of Materials Analysis of Bones (9 lectures) Strength of Materials Analysis of Prostheses (5 lectures) Structure-function properties of soft tissues (5 lectures) Viscoelastic models of tissues (3 lectures)	
Laboratory Projects:	1. Introduction and student team presentation (1 week) 2. Statics analysis of lower back injury biomechanics (1 week) 3. Statically indeterminate joint load problem solutions (1 week) 4. Gait experiments and analysis (5 weeks) 5. Hip prosthesis design (1 week) 6. Viscoelastic analysis of experimental data (1 week)	
Class/Lab Schedule:	Three 50-minute lectures per week. One 170-minute lab per week.	
Contribution of Course to Meeting the Professional Component:	(a) College-level mathematics and basic sciences: (b) Engineering Topics: Design: (c) General Education: (d) Other:	1 credits 2 credits 1 credit 0 credits 0 credits
Prepared by: Stephen Klisch	**Date:** 10/11/19	