

## **BIME 4030: Biomechanics and Materials**

This course is required for the Biomedical Engineering concentration.

Course Coordinator:

Stephanie T. Sullivan

Catalog Description:

Concepts of statics, dynamics, mechanics of materials and fluid mechanics applied to biological systems. Characterization of biological materials including time-dependent properties.

Course Structure:

Four 50-minute lectures (four credits)

Prerequisites:

ICEE 3004, 3024

Required Materials:

*An Introduction to Biomechanics: Solids and Fluids, Analysis and Design*, Jay D. Humphrey and Sherry DeLange, Springer, 2004, ISBN 0387402497

Course Objectives:

Upon completion of this course each student will be able to:

- Apply deformable-body mechanics principals to bones and soft tissues
- Analyze position, velocity, and acceleration in the skeletal system
- Describe the characteristics of biological materials
- Apply fluid mechanics principles to blood flow
- Identify materials used in implants, and discuss issues of compatibility

Course Outline

Topics covered in this course include:

- Review of concepts of stress and strain
- Viscoelasticity
- Properties of bone, muscle, tendons, and ligaments
- Review of dynamics concepts
- Multi-body kinematics
- Application of kinematics to skeletal system
- Review of fluid mechanics principles
- Characteristics of blood
- Navier-Stokes and Bernoulli equations
- Flow and pressure measurements
- Materials for implants

Relevant Program Outcomes:

Graduates of the BS in Engineering Program will demonstrate:

- c) Graduates of the Engineering Program will demonstrate 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.
- h) an understanding of the impact of engineering solutions in a global, economic, environmental, and societal context.
- i) a recognition of the need for, and an ability to engage in life-long learning.
- j) a knowledge of contemporary issues.
- L4) Address problems associated with the interaction of living and nonliving systems.

Professional Component Content:

Math/Science: 0;      Engineering: 4 cr;      General Education: 0

Assessment Requirements:

Student Work Samples:

- Paper related to the failure of a biomedical device (outcomes i, j, and h)

Targeted Exam Questions (Outcome L4)

Student Course Survey (outcome c)

Last Review:

October 8, 2008 by Stephanie T. Sullivan