

BME 430 Biomedical Engineering Laboratory
Required
Fall

2004-2005 Catalog Data: This course provides experience with the unique problems associated with making measurements and interpreting data in living systems; experiments may include mechanical testing of biological materials, imaging and physiological measurements (EKG, EMG, ECG, etc.).
Prereq: BME 310; Statistics 251, ME 321 or consent of instructor.

Textbook: None.

Other Required Material: Laboratory manuals.

Prerequisites by Topic

1. Biomechanics
2. Statistics
3. Strength of materials

Course Objectives

(Program Objectives supported by each course objective are indicated.)

1. Introducing students to different experimental techniques and multidisciplinary nature of biomedical engineering by performing different experiments related to some selected areas in biomedical engineering, such as physiology, imaging, and biomechanics. [1]
2. Providing students with a basic knowledge of performing experimental investigations in biomedical engineering. This includes initial background, experimental set-up, performing experiments, data analyses, and discussion. [2, 4]
3. Students will be able to write a quality technical report considering the nature of experiments performed. [2, 3, 4]

Topics Covered

1. Lecture: Introduction to Biomedical Testing.
2. Lecture: Description of the first five experiments.
3. Power Lab tutorial: To familiarize students with the PowerLab system (hardware and software) for performing Physiology experiments.
4. Experiment 1: Biomedical Device Electrical Safety Testing. Utilizing an electrical leakage tester to characterize the condition of a laboratory wall receptacle and leakage currents in a test device under a specified set of operating conditions.
5. Experiment 2: Biomedical Fluid Viscometry. Measurement of viscosity of pseudo-biofluids utilizing a rotating cylinder system.
6. Experiment 3: Imaging (microscopy). Operating a video microscope, capturing images, and analyzing images recorded. Human trabecular bone slides are studied.
7. Experiment 4: Blood pressure. Become familiar with auscultation (Listening to the sounds of the body) and measurement of blood pressure.

8. Experiment 5: Electrocardiogram (ECG) and Heart Sounds. Record and analyze ECG and observing the relationship between the ECG (heart electrical activity) and the characteristic sounds of the heart.
9. Lecture: Introduction to bone mechanical testing, Description of experiments 6-10.
10. Lecture (tutorial): Operating a Mechanical Testing System: To familiarize students with the Instron Mechanical Testing system (hardware and software) for performing mechanical testing of biological tissues.
11. Experiment 6: Electromyography (EMG). To explore the electrical activity of skeletal muscle by recording electromyograms from a volunteer.
12. Experiment 7: Breathing. To get familiarized with various aspects of breathing by recording breathing movements with a respiratory belt transducer.
13. Experiment 8 (project): Mechanical Testing of Bone. Performing a detailed and complete experimental study including specimen preparation, computer and machine set-up, performing experiments, analyses and graphical presentation of data, and statistical analyses.
14. Experiment 9 (continuation of project): Measurement of bone density using an analytical balance.
15. Experiment 10 (Fluid Mechanics).
16. Electronic signal analysis

Class/Laboratory Schedule: 1 three-hour lab/wk

Evaluation: Homework

Performance Criteria

Objective 1

- 1.1 Students in teams will perform different experiments from different disciplines of biomedical engineering as indicated above under "Topics Covered"

Objective 2

- 2.1 Students will demonstrate an understanding and knowledge of the background, experimental procedure, and analyses of each experiment being performed

Contribution of course to meeting the professional component: See Tables 4.3.1, 4.3.2.

The course supports the following Program Outcomes: a, b, d, e, g, i, k

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