

BME 4550/6550 – Bioinstrumentation

Course Description

Various electrodes, transducers, chemical sensors, special circuits, devices and methods for measuring biological signals and variables; therapeutic and prosthetic devices; electrical safety.

Undergraduate/Graduate level – 4 credit hours.

Corequisite: BME 4550L/6550L

*Homework and exams are specific for the graduate students. In them concepts are explored at a deeper level than for undergraduates.

Course Learning Objectives

Students will be able to understand and describe various electrodes, transducers, chemical sensors, special circuits, devices, and methods for the measurements of biological signals and variables, as well as important therapeutic and prosthetic devices.

Course Learning Outcomes

Students completing the course can; understand and describe various electrodes, transducers, chemical sensors, special circuits, devices, and methods for the measurements of biological signals and variables, as well as important therapeutic and prosthetic devices.

Tentative Weekly Schedule

Week 1	Review of electrical circuits and devices; Review of signals and systems; Intro to bioinstrumentation
Week 2	Strain gage transducers, bridge circuit; Inductive and capacitive transducers, intro to piezoelectric transducers
Week 3	Piezoelectric transducers (continued); Transducers for temperature measurement; EXAM I
Week 4	Origin of biopotential ECG, ENG, EMG, EEG
Week 5	Biopotential electrode; electrode-electrolyte interface; Various electrodes; EXAM II
Week 6	Ideal Op-Amps: inverter, follower, differential amplifier; Integrator, differentiator; Active filters
Week 7	Several useful circuits using op-amps; Real op-amps; EXAM III
Week 8	ECG vector; Biopotential amplifier
Week 9	Blood pressure measurement
Week 10	Cardiac catheterization; Heart sound and murmur; EXAM IV
Week 11	Blood flow measurement
Week 12	Blood flow measurement (continued); Blood volume measurement
Week 13	EXAM V; Measurements of blood oxygen saturation and blood cells
Week 14	Pacemaker and defibrillator; Electrical safety
Week 15	EXAM VI