

Medical Instrumentation

ECE 525 – Fall, 2003

Course Description: Fundamentals of medical instrumentation systems, sensors, and biomedical signal processing. Example instruments for cardiovascular and respiratory assessment. Clinical laboratory measurements, therapeutic and prosthetic devices, and electrical safety requirements.

Prerequisites: Consent of the instructor. Electrical and computer engineering seniors and graduate students may register for the course. Advanced undergraduates and graduate students from other curricula may take this course if they have completed an electronics course covering the use of operational amplifiers and are able to perform signal analysis using MATLAB®.

Textbook: John G. Webster (Editor), Medical Instrumentation: Application and Design. Boston: Houghton Mifflin, 1998 (Third Edition). ISBN 0-471-15368-0.

Instructor: Troy Nagle, Professor of ECE
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Office Hours: Office hours will be conducted over the Internet in a Chatroom established for the course. An appointment for telephone discussions can be arranged by e-mail at any time. An accompanying course Bulletin Board will be used for a continuing dialogue between all the students and the instructor.

Outline/Topics: Basic concepts and principles of measurement, Review of amplifiers and signal processing, Origin of biopotentials, Biopotential electrodes and amplifiers, Measuring blood pressure and sound, Measuring blood flow and volume, Measuring respiratory performance, Chemical biosensors, Clinical laboratory instrumentation, Therapeutic and prosthetic devices, Electrical safety.

Lectures: The Web-based course will have no formal lectures. Lecture materials will be posted to the Web in the form of PowerPoint files with sound and video inserts. Students will download the files from the course Website and view the contents at their convenience. Hence, each student must have access to an IBM PC with sound output.

Homework: No formal homework is required for this course.

Class Projects: *Project #1.* First, each student will design and simulate (using Spice) and/or build a prototype signal amplifier (ecg or eeg). Then typical data files will be analyzed using MATLAB® to detect parameters such as heart rate. *Project #2.* Each student will design and simulate and/or build a portion of a medical monitoring device. The data acquisition system for the device is an existing PalmPilot® system that captures data and transfers it to an IBM PC. Students will analyze data from the PalmPilot® using MATLAB® to determine performance metrics.

Grading:	Project #1	20%
	Project #2	40%
	Midterm Exam	20%
	Final Exam	20%