

BME 698

Physiological Measurements



CLASS HOURS

Thursday 2:30 to 5:25 (Fenster 640)

OFFICE HOUR (Fenster 611)

Thurs 1:00 to 2:00

or by appointment

Email: tara.l.alvarez@njit.edu

TEXT

Introduction to Biomedical Equipment Technology 4th Edition by Joseph Carr and John Brown
ISBN: 0130104922

Supplemental handouts will be provided as needed.

Course Material: available at <http://web.njit.edu/~alvarez/classes.htm>

COURSE DESCRIPTION

This course is an introduction to instrumentation and does not assume a strong background in the field. This course teaches the hardware and instrumentation needed to measure variables from different physiological systems. Electrodes, sensors and transducers. Bioelectric amplifiers. Hardware for measurement of the ECG, EEG, EMG, respiratory system, nervous system. Clinical laboratory instruments. Electrical safety. Computers in biomedical instrumentation.

LEARNING OUTCOMES

By the end of the course you should be able to do the following:

1. **Biomedical Signals and Instrumentation Sensors:** Learn several signals that can be measured from the human body. Specific examples include temperature, electrical, and pressure signals. Understand how noise from the environment, instruments and other physiologic systems can create artifacts in instrumentation. Understand the theory of how several sensors operate and use these sensors in laboratory sessions. Specific examples include thermistors and electrodes.
2. **Instrumentation Design:** Understand theory and design on Wheatstone bridge; inverting, noninverting, differential and instrumentation amplifiers. Design filters necessary to condition and isolate a signal. Understand how signals are digitized and stored in a computer or presented on an output display.
3. **Instrumentation Application:** Review the cardiac, respiratory and neural physiological systems. Study the designs of several instruments used to acquire signals from living systems. Examples of instruments studied include ECG, blood pressure monitors, spirometers, EEG, MRI, and ultrasound. Integrate information learned about biomedical signals, sensors and instrumentation design to create a design of your own.
4. **Work in Multi-disciplinary Teams:** Learn written and oral communication skills necessary to present information learned from laboratory sessions. Learn how to work in a group to attain a common goal.

COURSE OUTLINE*

Class	Date	Reading	Subject	Homework & Report Due Dates
Class 1	9/2/10	3 & 4 & 5	Decibels and Basic Theories of Measurement/ Studio exercise from Chapter 3 & 4 Start Signals and Noise	Assign Ch3 Prob 16,17,21 Ch4 Ques & Prob 5, 18, 19, 21,22
Class 2	9/9/10	5 & 6	Signals and Noise & start Electrodes, Sensors and Transducers	Assign Ch5 Prob 4, 6, 7, 8, 10, 11, 12, 13
Class 3	9/16/10	6	Electrodes, Sensors and Transducers & Lab 1 Wheatstone Bridge	Assign Ch6 Prob 1, 3 to 6, 9
Class 4	9/23/10	7	Start Bioelectric Amplifiers & Lab 2 Amplifier Lab	Lab 1 Report Due
Class 5	9/30/10	7	Finish Bioelectric Amplifiers & Lab 3 Filter lab	Assign Ch 7: Problems 1-10 Lab 2 Report Due
Class 6	10/7/10	2	Finish amplifiers and go through Heart & Circulatory System	Assign Ch 2 Ques 1-39 (single word answers)Ch 2 Prob 1, 3, 7, 12, 14, 17, Lab 3 Report Due
Class 7	10/14/10	8	Electrocardiographs	Assign Ch 8 prob 1 & other problems assigned at end of lecture
Class 8	10/21/10		Midterm Exam	
Class 9	10/28/10	9	Review Exam and start Physiological Pressure & other Cardiovascular Measurements & Lab 4	
Class 10	11/4/10	9	Finish Physiological Pressure & other Cardiovascular Measurements & Sphygmomanometer & FDA Lab Exercise 5	Ch 9 Prob 1, 3, 5 – 8, 10, 12, 15, 16 Lab 4 Due
Class 11	11/11/10	10-11	Human Respiratory System	Ch 10 Prob 1 to 7 Lab 5 Due
Class 12	11/18/10	12-13	Human Nervous System & Instrumentation for Measurement of Brain Function (EEG)	
	11/25/10	No class (Thanksgiving)		
Class 13	12/2/10		Presentation Design Lab 6	
Class 14	12/7/10		Functional Electrical Stimulation and Brain Computer Interfaces and Review (NOTE TUES)	
Class 15			FINAL to be announced	

***The Course Outline may be modified at the discretion of the instructor or in the event of extenuating circumstances. Students will be notified in class of any changes to the Course outline and schedule of studio/ laboratory sessions.**

Grading:

Item	Percentage of Grade
Midterm	40%
Final	40%
Design Presentation & Report	15%
Homework & Lab Assignments	5%
Total	100%

Attendance is mandatory. Failure to attend class regularly will result in a failing grade. No makeup examinations will be administered. If a valid, documented excuse for a missed exam is provided, the weight of the Final Exam will increase to compensate for the missed grade.

Assignments: You are responsible for all weekly reading, homework assignments and laboratory experiments. The reading should be completed BEFORE class each week. Homework and Laboratory Reports are due one week after the assignment. All assignments, homework, laboratory reports, and exams must be completed by due date. There are no late exams and any homework or reports handed in late will receive a zero.

Honor Code Violations/Disruptive Behavior:

NJIT has a zero-tolerance policy regarding cheating of any kind and student behavior that is disruptive to a learning environment. Any incidents will be immediately reported to the Dean of Students. In the cases the Honor Code violations are detected, the punishments range from a minimum of failure in the course plus disciplinary probation up to expulsion from NJIT with notations on students' permanent record. Avoid situations where honorable behavior could be misinterpreted.

No eating or drinking is allowed at the lectures, recitations, workshops, and laboratories. Cellular phones must be turned off during the class hours.