BE511 Schedule Fall, 2009

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Lecture: Tue, Thu 12-2 pm SOC B59 **Lab:** Fri 2-5 pm ERA 209

Course Website: http://courseinfo.bu.edu/courses/09fallengbe511_a1/

Textbook: Medical Instrumentation: Application and Design. 4th edition, John G. Webster, Ed.; Wiley, New York, 2009

Grading:		
	Homework	10%
	Lab Reports	15%
	Hour Exams (2)	40%
	Final Exam	25%
	Semester Project	10%

Hour Exams: October 15
November 19

Final Exam: TBD

Course Goals:

1. To understand the basic principles of biomedical instrumentation, measurements, and electronic prosthetics.

2. To understand the physiological origin of biosignals commonly measured in research and clinical settings and the techniques used to detect them

3. To be able to design simple instrumentation systems.

Course Prerequisites:
ENG SC 410 (Introduction to Electronics) and ENG BE 402 (Control Systems in Biomedical Engineering)

Lecture Schedule

#	Date	Lecture Topic	Reading	Laboratory
Part 1: Signal Conditioning and Signal Processing				
1	Sept 3	Basic Instrumentation Concepts	Webster - Chapter 1	
2	Sept 8	Fourier Analysis		
3	Sept 10	Transfer Functions		Lab 1: Fourier Analysis
4	Sept 15	Power Spectra, Signals and Noise		
5	Sept 17	Data Acquisition		Lab 2:Data Acquisition
6	Sept 22	Amplifiers - General Principles	Webster - Chapter 3	
7	Sept 24	Active Filters	Webster - Chapter 3	Lab 3: Simple Amplifiers
Part 2: Critical Care and Patient Monitoring				
8	Sept 29	Temperature Measurements	Webster - Chapter 2	
9	Oct 1	Biopotential Monitoring, EEG, ECG	Webster - Chapter 4	Lab 4: Active Filters
10	Oct 6	Biopotential Electrodes	Webster – Chapter 5	
11	Oct 8	Biopotential Amplifiers, CMRR	Webster – Chapter 6	
	Oct 13	**No Class – Monday Schedule**		
	Oct 15	**Hour Exam**		Lab 5: Temperature Sensors
12	Oct 20	60Hz Interference, Electrical Safety	Webster – Chapter 14	
13	Oct 22	Impedance Plethysmography	Webster – Chapter 8, 9	Lab 5: Diff Amp Circuits
14	Oct 27	Blood Pressure Measurement	Webster – Chapter 7	
15	Oct 29	Respiratory Mechanical Measurements	Webster – Chapter 8, 9	
16	Nov 3	Blood & Respiratory Gas Measurements	Webster – Chapter 9,10	
Part 3: Therapeutic and Prosthetic Devices				
17	Nov 5	Sensory substitution devices		Lab 6: Pressure Sensors
18	Nov 10	Cochlear Prosthetics	Loizou (1998, 2006)	
19	Nov 12	Spinal Cord Stimulation	Falowski et al (2008)	Lab 7: Cochlear Implants
20	Nov 17	Defibrillators	Webster - Chapter 13	
	Nov 19	**Hour Exam**		Lab 8: Defibrillators
21	Nov 24	Cardiac Pacemakers	Webster - Chapter 13	
Part 4: Clinical Laboratory Instrumentation				
	Nov 26	**No Class - Fall Recess**		
22	Dec 1	Electrochemical Sensors	Webster - Chapter 10	
23	Dec 3	Spectrophotometry & Spectrofluorometry	Webster - Chapter 11	Student Project Reports
24	Dec 8	Flow Cytometry	Invitrogen (2007)	
25	Dec 10	Final Exam Review		

Supplemental Reading

Falowski S, Celii A, Sharan A. (2008) Spinal cord stimulation: an update. Neurotherapeutics. 2008 Jan;5(1):86-99.

Invitrogen (2007) Fluorescence Tutorials http://probes.invitrogen.com/resources/education/

Loizou, PC (1998) Mimicking the Human Ear. IEEE Signal Processing Magazine Sept. 1998, pp 101-130. Available online at: http://www.utdallas.edu/~loizou/cimplants/tutorial/introci.pdf

Loizou, PC (2006) Speech processing in vocoder-centric cochlear implants. In: Cochlear and Brainstem Implants. A. Møller (Ed.) Adv Otorhinolaryngol. Basel, Karger, vol 64, pp 109–143. Available online at: http://www.utdallas.edu/~loizou/cimplants/chap_loizou_review2006.pdf