

COURSE OUTLINE

BAE 5413

SPRING 2007

INSTRUMENTATION IN BIOLOGICAL PROCESS CONTROL SYSTEMS

INSTRUCTOR: Dr. Marvin Stone
213 Ag Hall
Phone 744-4337
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Office Hours: 8:30-10:00AM Weekdays, other times when in, (call first).

PREREQUISITES: BIOEN 3023 or Equivalent

COURSE OBJECTIVES: The primary objective of the course is to provide a fundamental understanding of the science, design, and application of instrumentation and control in biological systems. In addition, to homework and lecture, a practical design project will be completed at the end of the semester and will involve design, construction, and testing of an instrumentation system.

SUBJECT OUTLINE:

Universal Concepts in Instrumentation Systems

1. Fundamentals of instruments
2. Static and dynamic response of sensors and instrumentation systems
3. Frequency response of sensors and instrumentation systems
4. Sampled data considerations
5. Error Analysis
6. Grounding and shielding
7. Communication and data storage
8. Instrumentation system optimization

Survey of sensing techniques and applications. During the study of instrument fundamentals, response characteristics, and data acquisition considerations, students will be exposed to various sensor types, and techniques for interfacing each type. General types of sensors considered will be:

1. Optic
2. Dielectric
3. Acoustic
4. Magnetic

Special considerations in biological systems. A component of the course will be dedicated to the special techniques required in biological systems and will include the following topics:

1. Low level signal technique
2. Safety
3. Aseptic technique
4. Corrosion

Applied computer interfacing. Laboratory time will be dedicated to a hands on experience with RS-232 interfacing, A/D technique and basic digital I/O. Each of the topics will be addressed in lecture.

1. A/D technique
2. Basic digital I/O
3. Serial communications (RS232)

5. Applied grounding and shielding

Emerging sensing technologies. New sensor systems will be surveyed and potential techniques for bio-sensors will be covered.

EXAMINATIONS AND ASSIGNMENTS: All students will be given homework projects in which cooperative work with other students will be encouraged. Closed book/notes examinations over homework and lectures will be given as scheduled. Assignments are due at the beginning of the period, one week after the assignment was made. No more than half credit will be given for assignments that are late. No credit will be given for assignments that are over one class period late. Students with appropriate excuses and prior arrangements with the instructor may reschedule examinations.

SCHEDULE: The following target schedule will be used:

Week 1:	Fundamentals Of Instruments And Introduction To Test Instrumentation
Week 2:	Static Characteristics Of Instruments And Calibration Technique.
Week 3:	Dynamic Characteristics of Instruments and Sensors.
Week 4:	Dynamic Characteristics of Instruements and Sensors.
Week 5:	Analog Signal Processing
Week 6:	Amplifiers, and Active Signal Processing
Week 7:	Grounding and Shielding
Week 8:	A/D Conversion
Week 9:	Micro-Computer Interfacing and Introduction to Digital Data Acquisition
Week 10:	New Sensor Technologies
Week 11:	New Sensor Technologies
Week 12:	Design Project
Week 13:	Design Project
Week 14:	Design Project
Week 15:	Design Project

GRADING:

Project	60%	7 lab. projects	@ 8.57%
Examinations	40%	2 exams	@ 20% each

The final grade will be based on the total percentage of the above determined from the following table.

%-Range	Grade
100-90	A
89-80	B
79-70	C
69-60	D
59-0	F

DROP POLICY: See "University Academic Regulations" Section 5.4 of the OSU catalog.

SCHEDULE:

Mid-Term Exam:	Tuesday, March 7
Final Exam	Thursday, May 4th, 10:00-11:50