E232 Lecture Syllabus (two 50 min. lectures per week)

Course Description:

Signal acquisition procedures; instrumentation components; electronic amplifiers; signal conditioning; lowpass, high-pass and band-pass filters; A/D converters and antialiasing filters; instruments for measuring physical quantities such as motion, force, torque, temperature, pressure, etc.; FFT and elements of modern spectral analysis; random signals; standard deviation and bias; introduction to control systems in engineering applications.

Textbook

Introduction to Engineering Experimentation, 2/E

Anthony J. Wheeler, Ahmad R. Ganji, both of San Francisco State University Publisher: Prentice Hall Copyright: 2004

ISBN-10: 0130658448

Prerequisites:

E231 (Design III) and E245 (Circuits and Systems)

Grading Policy:

The overall E232 course grade is made up of two components, $1/3^{rd}$ of the total grade is based on the E232 lab, $2/3^{rds}$ of the grade is based on the E232 lecture. Students must receive passing grades in **both** the lab and lecture to pass the course.

The course lecture section grade is based on Three quizzes, 25% each Approximately 10 weekly homework assignments, 25% total

Course Components:

Engineering 100%

Course Web Site:

http://koala.ece.stevens-tech.edu/~bmcnair/Design-4-XXX/index.htm where XXX is the current semester (e.g., F07) Lecture slides are posted on the web site above, quizzes, homework solutions, and grades are posted on https://elearn.stevens.edu

Schedule of Topics

- 1. General Aspects of Measurement Systems
 - o components of a measuring system

- o error systematic & random, accuracy, precision, sensitivity
- o calibration
- o dynamic measurement systems response, damping, etc
- 2. Electrical Output Measurement Systems
 - sensors, amplification (review op amps from E245 and extend to op amp circuits), attenuation, filtering
 - o measurement instruments
 - o signal transmission
 - o sensor principles and characteristics
- 3. Computer-based Data Acquisition Systems
 - system components principles of A/D & D/A conversion
- 4. Sampling and Related Aspects of Measurement Systems
- 5. Statistical Aspects
- 6. Sensor Systems for Engineering Applications
 - measurement of various parameters of interest to engineers, e.g. temp, pressure, flow, vibration, stress, liquid level, gas
- 7. Dynamic Systems
 - dynamic measurement issues applied to practical engineering applications
- 8. Aspects of the Control of Systems
 - o basic concepts of control
 - i. proportional, integral, derivative
 - ii. applied to practical engineering applications

Last revised January 2, 2008