EE 60671: Advanced Digital Processing
Fall 2012

Instructor: Prof. Ken Sauer
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Office hrs.: Open
Lecture: TR, 12:30 - 1:45 PM, 304 DeBartolo Hall
Homework: 8-10 assignments during semester
Grading: 35% final exam, 30% midterm, 20% homework, 15% project
Web site: http://www.nd.edu/~sauer/DSP2

Tentative Course Outline

1. Discrete-Time Random Signals (Sections 2.6, 5.3, 12.1, other sources)
   Definitions; ensemble and temporal averaging; ergodicity; correlation properties; spectral representation; linear systems and random signals.

2. Sampling Considerations, Finite Precision Effects (chapters 6,9)
   AD/DA; signal, system coefficient quantization noises; oversampling converters.

3. Multirate DSP (chapter 11 & handouts)
   Interpolation, decimation; filter bank design; polyphase structures.

4. Optimal Filtering of Random DT Signals (chapters 12-13)
   Prediction, lattice filters; Wiener, Kalman filters; LMS and RLS adaptive filters

5. Power Spectrum Estimation (chapter 14)
   Autocorrelation/spectral properties; periodogram methods; parametric PSD estimation; eigennanalysis methods

Miscellaneous Comments

- We will assume you have had a standard undergraduate-level course on digital signal processing. The same text is used for DSP I, so anything missing in your background should be available in sections we omit from this course. You may also find some more basic DSP texts are helpful in filling background.

- The project will be independent study on a DSP topic of your choice, with written reports due during the last two weeks of the semester. You will be required to find a current research paper(s) on the topic and perform some combination of analysis and simulation of the proposed methods. Time permitting, oral reports will be held in class at the end of the semester.

- Office hours are given as “open,” meaning they are not restricted to pre-set times. Students may drop in whenever they have a question, with the understanding that I may not always be in, or may not have a lot of time at the moment when you happen to appear. It is probably worth your while to e-mail to see whether I’m available.