

ECE 5550
Fall 2007
Severance

Course Syllabus *Digital Signal Processing*

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Office Hours:
2:00 to 3:00 pm Monday
2:00 to 3:00 pm Tuesday
2:00 to 3:00 pm Wednesday
2:00 to 3:00 pm Thursday
2:00 to 3:00 pm Friday

Prerequisites:
ECE 3800 (random variables and random processes),
ECE 4550 (Digital Signal Processing),
CS 1110 (computer programming using C),
or equivalent.
Generally this means that you will be an engineering, science or mathematics major who can program a computer and has a good degree of mathematical maturity. If this is not the case, consult with the professor first!

Course Objectives: As a student, you should be able to...

1. Formulate an accurate mathematical description of a myriad of physical system models
2. Understand the practical ramifications of the Nyquist criteria,
3. Use Z-transforms in describing digital systems
4. Implement both FIR and IIR filters
5. Implement predictive filters.

Text and Materials:

1. [required] *Digital Signal Processing [Principles, Algorithms and Applications]*, 4th edition by John G. Proakis and Dimitris G. Manolakis, published by Prentice Hall, 2007. Note: If you already have the 3rd edition (published in 1997) of this text, I will try to correlate problem sets and reading material so that this work best for you.
2. [required] Supplementary course handouts available at the course Web-site.
3. Access to a computer to create simulations using MatLab or MathCAD, Visual Basic (or a similar high-level programming language) and a spreadsheet (such as Excel.)

Grading: There will be bi-weekly assignments from the text, each of which will be graded and returned at the next class period. Also there will be three tests (60 minutes each) and one comprehensive final examination (120 minutes). The relative weight of each will be as follows:

7 assignments:	25%
3 tests (15% each):	45%
1 final examination:	35%

Final grades will be based on over-all class performance. Questions and problems will be similar to lecture examples and assignments. Make-up tests will be given only in emergencies when arrangements have been made in advance. If there are extenuating circumstances, I need to know quickly and *before* the disaster!

Class procedure:

This class meets once per week, at which time lectures will be conducted and examples given. These lessons will be in the traditional lecture - discussion format and your regular attendance is assumed. Class assignments will be based primarily on exercises from the text, along with several computer simulations. Examinations will be announced well in advance and no surprises (announced quizzes) will be given. If and when programming problems arise, see the professor.

Course Description:

This is a course in the principles of signal processing. While the discrete domain will be emphasized, continuous time and analog filters will also be discussed. The course will be taught in the traditional lecture/test format, with the assignments serving as feedback. This course satisfies the ABET design requirements. Specific topics include the following:

- Discrete Time Signals
 - Linear Time Invariant (LTI) systems
 - Analysis of LTI systems
 - Difference equations
 - Classical methods for solving difference equations
- Frequency domain analysis of signals and systems
 - Continuous signals
 - Discrete signals
 - Z Transforms
 - Analysis in the Z-domain
 - Range of convergence
 - Applications
- Sampling of signals
 - Time domain
 - Frequency domain
 - A/D and D/A conversions
 - Quantization error
 - Implementing discrete time systems
- IIR and FIR filters
 - Round-off effects
 - Digital filter design
 - DFT algorithm
 - FFT algorithm
- Linear prediction
 - Forward, backward linear prediction
 - Optimal linear filters

Academic Integrity:

All graded work, including homework assignments, is expected to be your own. If and when you have questions, you should consult your professor - he is very willing to help you. Failure to observe this rule may result in a failing grade for the course and referral to the Student Judiciary.