ECE 421 Syllabus

Course: ECE 421

Credit Hours: 3

Course Title: Introduction to Signal Processing

Course Description:

This elective senior-level course in digital signal processing develops essential analysis and design tools required for a broad range of disciplines (e.g. communications, geophysics, medical image processing, etc.). This course is an introduction to graduate-level courses in communications and signal processing.

Prerequisite(s): ECE 301, MATLAB experience.

Textbook(s) and/or other required material:

Required: J. G. Proakis, D. G. Manolakis, Ã¢â‚¬Å“Digital Signal Processing: Principles, Algorithms and Applications,Ã¢â‚¬Â Prentice Hall, Fourth Edition.

Optional: J. G. Proakis, V. K. Ingle, Ã¢â‚¬Å“Student Manual for Digital Signal Processing with MATLAB,Ã¢â‚¬Â Prentice Hall;

Vinay K. Ingle, John G. Proakis, "Digital Signal Processing Using Matlab," Thomson Learning, First or Second Edition.

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

1. Analyze and implement digital signal processing systems in time domain.
2. Compute the Fourier series and the discrete time Fourier transform (DTFT) of discrete-time signals.
3. Analyze digital signal processing systems using Z-transform and the DTFT.
4. Design frequency-selective digital filters.
5. Design digital filters using windows.
6. Sample and reconstruct analog signals.
7. Compute circular convolution and the discrete Fourier transform (DFT) of discrete-time signals.
8. Analyze and implement digital systems using the DFT and the Fast Fourier Transform (FFT).
9. Use MATLAB for DSP system analysis and design.

Topics covered:

1 Discrete-Time Signals and Systems and Z-Transform (6).
2. Frequency Analysis of Signals and Systems and Digital Filter Design (8).
3. Sampling and Reconstruction of Signals (4).
4. The Discrete Fourier Transform (DFT) and the Fast Fourier Transform (FFT) (8 lectures).

Class/laboratory schedule (sessions per week and duration of each session):

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Two 75-minutes lectures per week.

Contribution of course to meeting the requirements of Criterion 5 - other:

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

3 hours

Contribution of course to meeting the requirements of Criterion 5 - general education:

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	Major	Students apply basic math, science, and engineering to process signals analytically and numerically using MATLAB.
Outcome B	Major	Students write MATLAB code to design and analyze DSP systems in homework and project reports.
Outcome C	Intermediate	Students design realizable digital filters and solve real-word DSP problems in homework and projects.
Outcome D	Intermediate	Students work on projects in teams of 2-3 people.
Outcome E	Intermediate	Students in their homework and project are called upon working out realistic (or nearly so) problems and have to make appropriate decisions in

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
		completing a given task (e.g. they should pick the appropriate sampling rate of an analog signal, or design a notch filter to eliminate noise or interference.)
Outcome F	N/A	
Outcome G	N/A	
Outcome H	N/A	
Outcome I	Basic	The students call upon their basic mathematical knowledge as well as new math knowledge in the context of the course. This demonstrates to them that one never knows enough for solving problems they encounter unless they are willing to seek further external references.
Outcome J	N/A	
Outcome K	Intermediate	The students should apply their knowledge of basic system theory and circuit knowledge for many realistic examples. They demonstrate this knowledge through homework as well as in the project.

Person who last prepared this description and date of preparation:

- Duel-Hallen, Alexandra (sasha) - Mar 31st, 2009 (08:27pm)