EE 415 Digital Signal Processing

Designation: Elective

Catalog Description:
Discrete-time signals and systems, sampling, Z-transform, transform, transform analysis of linear time-invariant systems, filter design, discrete Fourier transform, and computation of discrete Fourier transform. Repeatable one time. Pre: 315 and 342 (or concurrent), or consent.

Credits: 4

Pre- and Co-requisites: pre: 315 and 342 (or concurrent), or consent.

Class/Lab Schedule: 3 hour lecture/3 hour lab.

Topics Covered:
Varies somewhat by instructor. Currently covered:
• Discrete Time Signals and Systems (2h)
• Difference equations (2h)
• DTFT (1h)
• DFT (2h)
• Z-transform (5h)
• The transfer function (3h)
• Stability (1h)
• Sampling and A/D (2h)
• Filter structures (1h)
• Filter design (4h)
• Sampling rate alteration (2h)
• Polyphase decomposition (1h)
• Filter banks (4h)
• FFT (2h)
• Random signals (3h)

Textbook and Other Required Materials:

Course Objectives and Relationship to Program Objectives:
Students should be able to (i) understand and analyze DSP problems and (ii) design DSP algorithms to solve DSP problems [Program Objectives 1,2,3,4,5].

Course Outcomes and Their Relationship to Program Outcomes
The course outcomes are closely related to the topics covered
• Understand Discrete Time Signals and Systems [1,5,11].
• Understand DTFT, DFT and FFT and be able to analyze systems using these tools.
Understand Z-transform and be able to analyze systems using this tools [1,5,11].
• Understand the influence of Sampling and A/D on DSP systems [1,5,11].
• Use system specifications to make decisions on filter design, and design filters using computer tools [1,2,3,5,11].
• Understand and design multirate DSP systems [1,2,3,5,11].
• Understand random signals [1,5,11].

Contribution of Course to Meeting the Professional Component
Engineering topics: 100%.

Computer Usage:
All labs and projects involve use of Matlab.

Design Credits and Features:
EE415 has 2 design credits. Most labs involve writing DSP programs in Matlab. In addition there is major design project, executed in several stages. The project used in past semesters is to design a subband codec for speech and music, similar to an MP3 coder.

Instructor(s): Todd Reed, Anders Høst-Madsen.

Person(s) Preparing Syllabus and Date: Anders Høst-Madsen, 3/30/09.