EL 7133: Digital Signal Processing
Spring 2013
Polytechnic Institute of New York University
Brooklyn, NY

Description

This course, which follows on from Signals and Systems, covers the fast Fourier transform, the short-time Fourier transform, the design and implementation of digital filters of several types: nonrecursive, recursive, multirate, etc. The course also introduces spectral estimation and illustrates its use for the enhancement of degraded speech signals.

Weekly assignments for this course require programming with MATLAB. Students who do not have prior experience with MATLAB can carefully read the tutorial (see below) before classes begin.

Outline

Week 1: Discrete Fourier transform and its properties
Week 2: Using the DFT, fast Fourier transform (FFT)
Week 3: Overview of digital filters, linear-phase filters
Week 4: Windows, frequency measurement, short-time Fourier transform
Week 5: Least-squares FIR filter design
Week 6: Minimax FIR filter design
Week 7: Spectral factorization, recursive digital filter design
Week 8: minimum-phase FIR filter design
Week 9: Multirate systems
Week 10: Finite precision effects
Week 11: Spectral estimation
Week 12: Inverse problems
Week 13: Transforms, DCT, & PCA
Week 14: Selected topics

Text


Other DSP textbooks are also good references (Mitra, Oppenheim & Schafer, Proakis, etc.)

Prerequisite

EL 611 or equivalent (discrete-time signals, systems, and transforms). The Schaum’s outline of ‘Digital Signal Processing’ by Monson Hayes serves as a good review of discrete-time signals and systems.
Software

MATLAB is a required software package for this course. Students registered for this course can have MATLAB installed on their laptop computer by the laptop office staff. Otherwise, the student version of MATLAB is available online at www.mathworks.com or at the bookstore (about 110$). You will also need the Signal Processing Toolbox (an extra 30$).

MATLAB manuals are available in PDF format at www.mathworks.com. More Matlab tutorials are available on the web at http://eeweb.poly.edu/iselesni/Matlab/

Grading

HW 10%
Report 10%
Midterm 40%
Final 40%

Web

Lecture notes, exercises, and due dates are posted online at:

http://eeweb.poly.edu/iselesni/EL713/zoom/

Instructor

Prof. Ivan Selesnick
selesi@poly.edu
(718) 260-3416
2MTC 10.004
http://eeweb.poly.edu/iselesni/

Address for Mail:
Prof. Ivan Selesnick
Electrical and Computer Engineering
Polytechnic Institute of New York University
6 Metrotech Center
Brooklyn
NY 11201-3840