University of Toronto
The Edward S. Rogers Sr. Department of Electrical & Computer Engineering
ECE362S, Winter 2013

Digital Signal Processing

Instructor: Prof. Deepa Kundur, BA 7104
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Main References

1. Class notes;
2. J. G. Proakis and D. G. Manolakis, *Digital Signal Processing: Principles, Algorithms, and Applications*, 4th ed., Pearson, 2007. ISBN 0-13-187374-1.

Lectures

Mondays	9:00 am – 10:00 am	GB 120	(LEC 01)
Wednesdays	1:00 pm – 2:00 pm	GB 220	(LEC 01)
Thursdays	4:00 pm – 5:00 pm	BA 1210	(LEC 01)

Tutorials

Thursdays	5:00 pm – 6:00 pm	BA 1210	(TUT 01)

Tutorials will begin the week of January 14, 2013 and will be used to teach problem-solving techniques based on the assigned problem sets as well as administer the two course tests. Regular attendance is *strongly recommended*. Problem sets will be assigned weekly by the Friday before the tutorial.

Labs

Mondays	12:00 pm – 3:00 pm	SF 2201	(PRA 01)

Specific Dates: Expt 1: Jan 28, Expt 2: Mar 4, Expt 3: Mar 18, Expt 4: Apr 1

Mondays	12:00 pm – 3:00 pm	SF 2201	(PRA 02)

Specific Dates: Expt 1: Feb 4, Expt 2: Feb 25, Expt 3: Mar 25, Expt 4: Apr 8

Composition of Final Mark

Labs:	20 %	
2 Tests:	30 %	(equally weighted); administered during tutorial
Final Exam:	50 %	

Course Description

Digital signal processing is the mathematical manipulation of a discrete-domain information signal to modify or improve it in some way. This course provides an introduction to fundamental concepts in digital signal processing. Topics include sampling and reconstruction, discrete-time signals and linear time-invariant systems, the z-Transform, discrete-time Fourier transform, fast Fourier transform, and discrete-time filters. Applications to audio, image, video and communications signal processing are provided throughout.

Syllabus (tentative):

- Introduction: Review of signal classes and the sampling theorem, overview of analog-to-digital and digital-to-analog conversion. (Text, §1.1-1.4)
- Discrete-Time Signals and Systems: Analysis of discrete-time linear time-invariant (LTI) systems, difference equations, implementation. (Text, §3.1-3.6)
- The z-Transform: definition, properties, rational z-transforms, inverse of z-transform, analysis of LTI systems in the z-domain. (Text, §3.1-3.5)
- Frequency-Domain Analysis: Discrete-time Fourier transform, frequency response of LTI systems, frequency selective filters, inverse systems and deconvolution (Text, §4.1-4.4, 5.1-5.5)
- Sampling and Reconstruction: Discrete-time processing of continuous-time signals, quantization errors, sampling of bandpass signals. (Text, §6.1-6.6)
- DFT and FFT: Discrete Fourier Transform, complexity of filtering, radix-2 fast Fourier transform (Text, §7.1, 7.2, 8.1)
- Implementation of Discrete-Time Systems: Structures for the realization of discrete-time systems, FIR systems, IIR systems, representation of numbers. (Text, portions of §9.1-9.4).
- Applications to audio, image and video processing. (supplementary notes).

Course Website

The course will make use of Blackboard (http://portal.utoronto.ca). *All students must register on Blackboard*. Course notices, handouts, office hours and important communications will be administered using this website.

Course Policies

- The ECE Undergraduate (UG) Office's policy on Petition for Consider in Course Work will be employed for missed tests and late assignments. Official supporting documentation must be provided and the completed petition must be filed with the UG Office.
- Questions regarding the marking of tests or assignments must be formally written on a piece of paper and submitted along with the test/assignment to the cognizant TA. There is a 48-hour limit from the time the test/assignment is first returned in which you may request a recheck.
- All tests and the final exam make use of a non-programmable (Type 2) calculator. No programmable calculators are allowed.