

Course Memo, Spring 2016 ECE 454/554 Digital Signal processing, 3 credits

Introduction: Introduction to principles of Digital Signal Processing (DSP) including sampling theory, aliasing effects, frequency response, Finite Impulse Response filters, Infinite Impulse Response filters, spectrum analysis, Z transforms, Discrete Fourier Transform and Fast Fourier Transform. Overviews of modern DSP applications such as modems, speech processing, audio and video compression and expansion, and cellular protocols. Four hours lecture/discussion.

Course Instructor

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Text Books:

- *Main book:* “Digital Signal Processing (4th Edition)” Authors: John G. Proakis and Dimitris K Manolakis, ISBN: 978-0131873742.
- *Main book:* “Digital Signal Processing—A Computer Based Approach”, Author: Sanjit Mitra , ISBN: 978-0077366766.
- *Supplementary book:* “Schaums Outline of Digital Signal Processing, 2nd Edition, Author: Monson Hayes, ISBN: 0071635092.

Means of Communication:

- *Website:* Lectures and all materials related to the course will be posted here.
- *Office hours:* They are scheduled for 2:15-3:15 on Thursdays.
- *Email:* You can email me at any time and I will try to do my best to answer your question or schedule you in for a meeting.
- *Phone:* You can call my office phone at any time and if I am available we can discuss any problem or issue you may be facing.

Evaluation

- *20% Homework:* There will be weekly homework that needs to be completed and handed in every Monday.
- *25% Project:* There is group project that the students select and complete. The goal of the project is to apply the principles of digital signal processing to a practical engineering problem. The projects are programming based and mainly done via Matlab, however, you can use any other software package as you wish. The project proposal needs to be emailed to the instructor based on the attached timeline.
- *15% Midterm 1:* Look at the attached time sheet for the date of midterm.
- *15% Midterm 2:* Look at the attached time sheet for the date of midterm.
- *25% Final exam:* The course is designed not to emphasize one big final exam.

Wednesday	Friday	Thursday
13-Jan-16	15-Jan-16	14-Jan-16
Lecture 1	Lecture 2	Office Hour 1
3:15-4:55	3:15-4:55	14:15-15:15
Introduction	Introduction to Discrete Time Signals	
Wednesday	Friday	Thursday
20-Jan-16	22-Jan-16	21-Jan-16
Lecture 3	Lecture 4	Office Hour 2
3:15-4:55	3:15-4:55	14:15-15:15
Homework 1		
Time Domain Processing: Convolution and Correlation	Time Domain Processing: Convolution and Correlation	
Wednesday	Friday	Thursday
27-Jan-16	29-Jan-16	28-Jan-16
Lecture 5	Lecture 6	Office Hour 3
3:15-4:55	3:15-4:55	14:15-15:15
Homework 1 due		
Homework 2		
Fourier Domain, Discrete-Time Fourier Transform and DFT	Fourier Domain, Discrete-Time Fourier Transform and DFT	
Wednesday	Friday	Thursday
3-Feb-16	5-Feb-16	4-Feb-16
Lecture 7	Lecture 8	Office Hour 4
3:15-4:55	3:15-4:55	14:15-15:15
Homework 3		
Homework 2 due		
The Z Transform	The Z Transform	
Wednesday	Friday	Thursday
10-Feb-16	12-Feb-16	11-Feb-16
Lecture 9	Lecture 10	Office Hour 5
3:15-4:55	3:15-4:55	14:15-15:15
Homework 3		
Homework 3 due		
Transform Domain Systems	Transform Domain Systems	
Wednesday	Friday	Thursday
17-Feb-16	19-Feb-16	18-Feb-16
Lecture 11	Lecture 12	Office Hour 6
3:15-4:55	3:15-4:55	14:15-15:15
Simple Filters and Linear Phase	Midterm 1	

Wednesday	Friday	Thursday
24-Feb-16	26-Feb-16	25-Feb-16
Lecture 13	Lecture 14	Office Hour 7
3:15-4:55	3:15-4:55	14:15-15:15
Homework 4		
Filter Structures	Filter Structures	
Wednesday	Friday	Thursday
2-Mar-16	4-Mar-16	3-Mar-16
Lecture 15	Lecture 16	Office Hour 8
3:15-4:55	3:15-4:55	14:15-15:15
Homework 5		
Homework 4 due		
IIR	IIR	
Wednesday	Friday	Thursday
9-Mar-16	11-Mar-16	10-Mar-16
Lecture 17	Lecture 18	Office Hour 9
3:15-4:55	3:15-4:55	14:15-15:15
Homework 6		
Homework 5 due		
FIR Filters	FIR Filters	
Wednesday	Friday	Thursday
16-Mar-16	18-Mar-16	17-Mar-16
Lecture 19	Lecture 20	Office Hour 10
3:15-4:55	3:15-4:55	14:15-15:15
Homework 7		
Homework 6 due		
Fast Fourier Transform	Fast Fourier Transform	
Wednesday	Friday	Thursday
23-Mar-16	25-Mar-16	24-Mar-16
Lecture 19	Lecture 20	Office Hour 10
3:15-4:55	3:15-4:55	14:15-15:15
Homework 8		
Homework 7 due		
Spring Break	Spring Break	
Wednesday	Friday	Thursday
30-Mar-16	1-Apr-16	31-Mar-16
Lecture 19	Lecture 20	Office Hour 10
3:15-4:55	3:15-4:55	14:15-15:15
Interfacing to continuous time	Midterm 2	

Wednesday	Friday	Thursday
6-Apr-16	8-Apr-16	7-Apr-16
Lecture 19	Lecture 20	Office Hour 10
3:15-4:55	3:15-4:55	14:15-15:15
Homework 9		
Homework 8 due		
Linear Prediction and Optimum Linear Filters	Linear Prediction and Optimum Linear Filters	
Wednesday	Friday	Thursday
13-Apr-16	15-Apr-16	14-Apr-16
Lecture 19	Lecture 20	Office Hour 10
3:15-4:55	3:15-4:55	14:15-15:15
Homework 10		
Homework 9 due		
Adaptive Filtes	Adaptive Filtes	
Wednesday	Friday	Thursday
20-Apr-16	22-Apr-16	21-Apr-16
Lecture 19	Lecture 20	Office Hour 10
3:15-4:55	3:15-4:55	14:15-15:15
Homework 11		
Homework 10 due		
Presentations	Presentations	
Wednesday	Friday	Thursday
27-Apr-16	29-Apr-16	28-Apr-16
Lecture 19	Lecture 20	Office Hour 10
3:15-4:55	3:15-4:55	14:15-15:15
Presentaitons	Presentations	
6-May-16		
Final Exam		
10:00-12:00 PM		