ECE 158, **Digital Signal Processing**, Fall 2008

Schedule: MW 4:00-5:30, Phelps 1437

http://www.ece.ucsb.edu/courses/ECE158/158_F08Gibson/default.html

Department of Electrical and Computer Engineering

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Office Hours: Thursday 3-4 pm
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Teaching Assistants:

Stephen Mangiat, smangiat@umail.ucsb.edu, Office Hours on Tuesday, 3-4 pm

Karthikeyan Shanmuga Vadivel, karthikeyan@umail.ucsb.edu, Office Hours Monday, 11am – noon

All TA Office Hours are held in Phelps 1435

Laboratory: Attendance in the laboratory is mandatory for all students.

Midterm Examination: **Monday, November 3rd**

Final Examination: **Saturday, December 13th, 4-7 pm, Phelps 1437**

Grading:		
	Homework	25%
	Midterm	25%
	Final	25%
	Laboratory	25%

Homework: Homework problem sets will be distributed in class on Wednesdays. Homework assignments are due the following Wednesday by 6 pm in the homework box in HFH 5154. ***Late Homework will not be graded.*** Solutions will be posted on the course web site.

Text: S. K. Mitra, *Digital Signal Processing: A Computer-Based Approach*, 3rd ed., McGraw-Hill, 2006.

Lectures:

Monday, September 29
Wednesday, October 1
Monday, October 6

Wednesday, October 8
Monday, October 13
Wednesday, October 15
Monday, October 20
Wednesday, October 22
Monday, October 27
Wednesday, October 29 This class meeting has been rescheduled
****Thursday, October 30** Class will meet in Phelps 1437 from 2 – 3:50 PM**
Monday, November 3 – Midterm Exam
Wednesday, November 5
****Friday, November 7** Class will meet in Phelps 1437 from 2 – 3:50 PM**
Monday, November 10
Wednesday, November 12
****Friday, November 14** Class will meet in Phelps 1437 from 2 – 3:50 PM**
Monday, November 17 Class rescheduled
Wednesday, November 19 Class rescheduled
Monday, November 24
Wednesday, November 26
Monday, December 1
Wednesday, December 3 Class rescheduled
****Friday, December 5** Class will meet in Phelps 1437 from 2 – 3:50 PM**

Recommended Reading in the Text:

Chapter 1: Signals and Signal Processing
1.1, Characterization and Classification of Signals
1.2.1, Simple Time-Domain Operations
1.2.2, Filtering
1.2.3, Generation of Complex-Valued Signals
1.2.4, Amplitude Modulation
1.2.5, Multiplexing and Demultiplexing
1.2.6, Quadrature Amplitude Modulation

Chapter 2: Discrete-Time Signals and Systems
2.1.1, Time-Domain Representation
2.1.2, Operations on Sequences (especially Sampling Rate Alteration),
2.1.3, Classification of Sequences (especially Periodic and Aperiodic Signals),
2.2.1, Some Basic Sequences
2.4.1, Discrete-Time System Examples
2.5.1, Input-Output Relationship
2.8.1, Classification Based on Impulse Response Length

Chapter 3: Discrete-Time Fourier Transform
3.1, The Continuous-Time Fourier Transform
3.2, The Discrete-Time Fourier Transform
3.3, Discrete-Time Fourier Transform Theorems

3.8.1, The Frequency Response of an LTI Discrete-Time System, Definition
3.8.2, Frequency-Domain Characterization of the LTI Discrete-Time System
3.8.3, Frequency Responses of LTI Discrete-Time Systems
3.8.7, The Concept of Filtering
3.9, Phase and Group Delays

Chapter 4: Digital Processing of Continuous-Time Signals
4.2, Sampling of Continuous-Time Signals
4.10, Reconstruction Filter Design
4.11, Effect of Sample-and-Hold Operation

Chapter 5: Finite-Length Discrete Transforms
5.1, Orthogonal Transforms
5.2, The Discrete Fourier Transform
5.3, Relation Between the Fourier Transform and the DFT, and Their Inverses
5.4, Operation on Finite-Length Sequences
5.6, DFT Symmetry Relations
5.7, Discrete Fourier Transform Theorems
5.9, Computation of the DFT of Real Sequences
5.10, Linear Convolution Using the DFT
5.11, Discrete Cosine Transform
5.12, The Haar Transform

Chapter 6: *z*-Transform
6.1, Definition and Properties
6.6, Computation of the Convolution Sum of Finite-Length Sequences
6.7.1, The Transfer Function, Definition
6.7.2, Transfer Function Expression
6.7.3, Frequency Response from Transfer Function

Chapter 7: LTI Discrete-Time Systems in the Transform Domain
7.4.3, Comb Filters
7.9.2, A Stability Test Procedure

Chapter 8: Digital Filter Structures
8.3.3, Polyphase Realization

Chapter 9: None

Chapter 10: FIR Digital Filter Design
10.2.4, Fixed Window Functions

Chapter 11: DSP Algorithm Implementation
11.3, Computation of the Discrete Fourier Transform
11.4, Fast DFT Algorithms Based on Index Mapping

Chapter 12: None

Chapter 13: Multirate Digital Signal Processing Fundamentals
13.1, The Basic Sample Rate Alteration Devices
13.2, Multirate Structures for Sampling Rate Conversion
13.4, The Polyphase Decomposition

Chapter 14: Multirate Filter Banks and Wavelets
14.1, Digital Filter Banks
14.2, Two-Channel Quadrature-Mirror Filter Bank
14.3, Perfect Reconstruction Two-Channel FIR Filter Banks
14.4.3, Polyphase Representation

Labs—Room 4152 HFH

First Wednesday Lab on 10/1 and first Monday Lab on 10/6

		Monday	**Wednesday**
Lab 1	MATLAB and the Moving Average	Oct. 6	Oct. 1
Lab 2	Sampling	Oct. 13	Oct. 8
Lab 3	Sample Rate Alteration	Oct. 20	Oct. 15
Lab 4	Linear Systems and Filtering	Oct. 27	Oct. 22
Lab 5	Windowing	Nov. 3	Oct. 29
Lab 6	The Discrete Cosine Transform	Nov. 10	Nov. 5
Lab 7	Filter Banks	Nov. 17	Nov. 12