

## EE 4637/5637 Digital Signal Processing

University of Colorado at Denver and Health Sciences Center  
College of Engineering and Applied Science

Term: Fall 2009

Course dates/days/times: Mon & Wed 4:00-5:15 PM

Course location

Office Hours: TBA

Professor: Al Fermelia

Office location

Phone: 303-771-6690

email address: clm-a@ix.netcom.com

### Course Design

*Catalog Description:* Digital Signal Processing. Discrete-time signals and systems in the time and frequency domain. Digital filter structures, design of FIR filters by windowing, optimum approximations of FIR filters. Design of digital IIR filters from continuous time domain. Computer-aided design of digital filters. The discrete Fourier transform and DSP algorithm implementation. Analysis of finite word length effects. Application of digital signal processing.

Prereq: EE 3316 and 3817.

*Instructor Description:*

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This is an introductory course for those students who would like to specialize and/or perform research in such areas like image and video processing, wireless digital communications, measurement systems, wavelet-based signal processing (JPEG2000 and Motion JPEG2000), and medical data processing.

Actually, every EE student should take this course. The students will learn what problems are involved in digital representations of data and how to solve them. They will learn how to design and implement digital filters and will effectively use some of the available design tools, in particular the MATLAB's Digital Signal Processing Toolbox. At least basic knowledge of Matlab is desired to take this course.

Course Objectives: What the students will earn in terms of new knowledge or new skills.

### Requirements

*Required Text:* S. Mitra: Digital Signal Processing, Third Edition,  
McGraw Hill, 2006

*Assignments and Examinations:*

- 13 Homeworks (scheduled below) – each homework is due every week after it is assigned. No late homeworks will be accepted unless previously agreed.
- Midterm Exam (scheduled below in the course outline) – this will be given only once on the scheduled day – no exceptions.
- Final Exam –. Scheduled by AHEC administration during the final week.
- Project – Of the Students choice

### Assessment Design:

Grades:

Homeworks:	20%
Midterm:	25%
Final:	25%
<u>Project</u>	<u>30%</u>
Total:	100%

All assignments must be presented in a form of Microsoft Word document and must include all plots with axis properly labeled and with proper titles. All figures must be numbered and explained in the text. The homework assignments will be returned to students in maximum two weeks.

**Course Policies:** No late work and no make-ups. Extensions only for valid reasons and only if agreed before the work is due.

## Course Schedule

### Class Schedule

Date	Topic	Required Reading	Assignments
Mon 2009-08-17 Wed 2009-08-19	Lecture 1: <a href="#">Introduction to discrete-time signals</a>	Chapter: 1-2.4	Set1~HW1 ~SP Set 1
Mon 2009-08-24 Wed 2009-08-26 Mon 2009-08-31	Lecture 2: <a href="#">Time domain processing: convolution, LCCDEs, correlation</a>	Chapter: 2.5-2.9 CLM Overview	Set2~HW2
Wed 2009-09-02	<a href="#">Fourier domain; discrete-time Fourier transform &amp; DFT</a>	Chapter: 3.1-3.6, 5.1-5.7, 5.10	Set3 ~ HW3
Mon 2009-09-07	Labor Day		
Wed 2009-09-09 Mon 2009-09-14	<a href="#">Fourier domain; discrete-time Fourier transform &amp; DFT</a>	Chapter: 3.1-3.6, 5.1-5.7, 5.10	Set4~ HW4
Wed 2009-09-16 Mon 2009-09-28	<a href="#">The z-transform</a>	Chapter 6.1-6.5	Set5~ HW5
Wed 2009-09-23 Mon 2009-09-28	<a href="#">Transform-domain systems</a>	Chapter 3.8, 6.7, 3.9)	Set6~ HW6
Wed 2009-09-30 Mon 2009-10-05	<a href="#">Simple filters, linear phase</a>	Chapter 7.1-7.4)	Se7~ HW7
Wed 2009-10-07	Review for Exam		
Mon 2009-10-12	<b>MIDTERM EXAM</b>		
Wed 2009-10-14 Mon 2009-10-19	<a href="#">More filter types; filter structures</a>	Chapter 7.6-7.7, 8.1-8.6)	Set8~ HW8
Wed 2009-10-21 Mon 2009-10-26	<a href="#">Analog filters and IIR filter design</a>	Chapter 4.4-4.5, 9.1-9.6)	Set9~ HW9
Wed 2009-10-28 Mon 2009-11-02	<a href="#">FIR filter design</a>	Chapter 10.1-10.5)	Set10~ HW10
Wed 2009-11-04 Mon 2009-11-09	<a href="#">The Fast Fourier Transform; Short-time Fourier transform</a>	Chapter 11.1-11.6,15.3	Set11~HW11
Wed 2009-11-11 Mon 2009-11-16	<a href="#">Interfacing to continuous time</a>	Chapter 4.6-4.11, parts of 12.1-12.6	Set12~HW12
Wed 2009-11-18			
Week of 2009-11-23 thru 27	<i>Thanksgiving - no class</i>		
Mon 2009-11-30	Projects Due & Discussion		
Wed 2009-12-02	Review for Exam		
Mon 2009-12-07	Final Exam		

## **Course Communication**

- Office hours to be arranged at a time of mutual agreement
- contact the instructor by e-mail to schedule an appointment at: [clm-a@ix.netcom.com](mailto:clm-a@ix.netcom.com)

## **Students called for military duty**

- If you are a student in the military with the potential of being called to military service and /or training during the course of the semester, you are encouraged to contact Paul Rakowski.