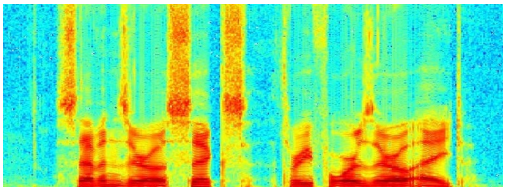

Digital Signal Processing

ECE 8440 SPRING 2017

http://cs.clemson.edu/~ekp/courses/ece8440

COURSE DESCRIPTION

Digital filter design; discrete Hilbert transforms; discrete random signals; effects of finite register length in digital signal processing; homomorphic signal processing; power spectrum estimation; speech processing, radar, and other applications. Prerequisite: Students are expected to have completed a course comparable to ECE 4670 before enrolling in this course.

CONTACT

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Office: 307 McAdams Hall
14:00 - 15:00 M W
11:00 - 12:00 T Th
Or by appointment.

Class: 15:35-16:50 M W
Vickery Hall 100

TEXTS

Discrete-Time Signal Processing, 3rd ed., by Oppenheim & Schafer.

GRADING

Test 1	25%
Test 2	25%
Homework	15%
Final Exam	35%

GRADING SCALE

A: 86-100
B: 71-85
C: 56-70
F: 0-55

Final exam is scheduled for 19:00-21:30 on Tuesday, May 2, 2017.

LEARNING OUTCOMES

1. Comprehension of principles of digital signal processing.
2. Application of statistical techniques for digital signal processing.
3. Design of digital filters.
4. Application of concepts of digital signal processing for engineering solutions.

COURSE TOPICS

Chapter 2 - Discrete-Time Signals and Systems (Read entire chapter for review.)

Example 2.18 - Square-Summability of Ideal Low-pass Filter	(Unit 1)
Example 2.20 - Fourier Transform of Complex Exponential Sequences	(Unit 1)
Section 2.10 - Discrete-Time Random Signals (to be covered between sections 4.8 and 4.9)	(Unit 5)

Chapter 4 - Sampling of Continuous-Time Signals

Example 4.4 - Discrete-Time Implementation of an Ideal Continuous-Time Band-limited Differentiator	(Unit 1)
Section 4.5 - Continuous-Time Processing of Discrete-Time Signals	(Unit 1)
Section 4.6 - Changing the Sampling Rate Using Discrete-Time Processing	(Unit 2)
Section 4.7 - Multi-rate Signal Processing	(Unit 3)
Section 4.8 - Digital Processing of Analog Signals	(Unit 4)
Section 4.9 - Oversampling and Noise Shaping in A/D and D/A Conversion	(Units 6, 7, and part of Unit 8)
Section 4.10 - Chapter Summary (read)	

Chapter 5 - Transform Analysis of Linear Time-Invariant Systems

Sections 5.1 - 5.3 - Review of Selected Topics	(Unit 8)
Section 5.4 - Relationship Between Magnitude and Phase	(Units 8 and 9)
Section 5.5 - All-Pass Systems	(Unit 9)
Section 5.6 - Minimum Phase Systems	(Unit 9)
Section 5.7 - Linear Systems with Generalized Linear Phase	(Unit 10)
Section 5.8 - Chapter Summary (read)	

Chapter 6 - Structures for Discrete-Time Systems)

Sections 6.1 - 6.2 - Review of Selected Topics	(Unit 11)
Example 6.3 - Determination of the System Function from a Flow Graph	(Unit 11)
Section 6.4 - Transposed Forms	(Unit 11)
Section 6.5 - Basic Network Structures for FIR Systems	(Unit 11)
Section 6.6 - Lattice Filters (if time permits)	
Section 6.7 - Overview of Finite-Precision Numerical Effects	(Unit 12)
Section 6.8 - Effects of Coefficient Quantization	(Unit 12)
Section 6.9 - Effects of Round-Off Noise in Digital Filters	(Units 13, 14, and 15)
Section 6.10 - Zero-Input Limit Cycles in Fixed-Point Realizations of IIR Digital Filters	(Unit 15)
Section 6.11 - Chapter Summary (read)	

Chapter 7 - Filter Design Techniques

Sections 7.1 - 7.6 - Review of Digital Filter Design Techniques	(Unit 16)
Section 7.7 - Optimum Approximations of FIR Filters	(Units 16 and 17)
Section 7.8 - Examples of FIR Equiripple Approximation	(Unit 17)
Section 7.9 - 7.10 - Chapter Summary (read)	

Chapter 8 - The Discrete Fourier Transform

Sections 8.1 - 8.6 - Review of Selected DFT Topics	(Unit 18 and 19)
Section 8.7 - Computing Linear Convolution Using the DFT	(Unit 19)
Section 8.8 - The Discrete Cosine Transform	(Unit 20)
Section 8.9 - Chapter Summary (read)	

Chapter 13 - Cepstral Analysis and Homomorphic Deconvolution (Unit 21-24)

Selected topics, time permitting:

Chapter 10 - Fourier Analysis of Signals Using the DFT

Chapter 12 - Discrete Hilbert Transforms

Tentative Schedule

JANUARY		**11**	
	Unit 1		
		18	
	Unit 2		
	23	**25**	
	Unit 3, 4		
FEBRUARY	**30**	**01**	
	Unit 5, 6		
	06	**08**	
	Unit 7, 8		
	13	**15**	Test 1
	Unit 9, 10		
	20	**22**	
	Unit 11		
MARCH	**27**	**01**	
	Unit 12, 13		
	06	**08**	
	Unit 14, 15		
	13	**15**	
	Unit 16, 17		
	SPRING BREAK		
	27	**29**	Test 2
	Unit 18, 19		
APRIL	**03**	**05**	
	Unit 19, 20		
	10	**12**	
	Unit 21, 22		
	17	**19**	
	Unit 23, 24		
	24	**26**	
	Selected topics, time permitting.		
MAY		**02**	Final Exam 19-21:30

CLASS POLICIES

Unless special circumstances are involved, more than three absences may result in class failure. Students are individually responsible for keeping current with course material and assignments.

Class announcements supersede posted material.
Academic honesty in all your work is required for a passing grade.
This syllabus and course materials may be subject to change with reasonable notice.

BOILERPLATE

As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a 'high seminary of learning.' Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form. In instances where academic standards may have been compromised, Clemson University has a responsibility to respond appropriately to charges of violations of academic integrity.

It is university policy to provide, on a flexible and individualized basis, reasonable accommodations to students who have disabilities. Students requesting accommodations should make an appointment with Disability Services (656-6848) to discuss specific needs within the first month of classes. Students should present a Faculty Accommodation Letter from Student Disability Services when they meet with instructors. Accommodations are not retroactive and new Faculty Accommodation Letters must be presented each semester.

Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran's status, genetic information or protected activity (e.g., opposition to prohibited discrimination or participation in any complaint process, etc.) in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972. The policy is located at http://www.clemson.edu/campus- life/campus-services/access/non-discrimination-policy.html. Jerry Knighton serves as Clemson's Title IX Coordinator, and he may be reached at knightl@clemson.edu or 656- 3181.