ECE 4773/6773: Digital Signal Processing

Time: MW 4:00 - 5:15 PM
Place: 203 Simrall

Textbook: J.G. Proakis and D.G. Manolakis, *Digital Signal Processing: Principles, Algorithms, and Applications*, 2nd Edition, Macmillan Publishing Company, 1992

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Attendance Policy:

"Since I have to show up to teach, you have to show up to listen."

We have a total of 45 classes plus a final and a Presentation Day. No un-excused absences will be tolerated — send me email prior to class if you can't make class. Students are only allowed three excused absences. Beyond that, you are in trouble.

What does it mean to attend class? You must sign up on the daily attendance sheet BEFORE class starts. I expect you in your seats ready to go at the beginning of class. Anyone who is late will not be given credit for the class. Similarly, class ends at the designated time. Students leaving early will not be given credit for that day's class. Finally, leaving the room during class and returning before the end of class will not be tolerated.

Attendance is used in borderline cases to decide whether a grade deserves to be raised (or lowered). In my experience, most students end up borderline cases — so good attendance becomes a key element of their final grade.

There will be no attendance requirement for Super Audits.

Grading Policies:

Exam:

50% Final Exam

Project:

20% Demonstration
20% Paper
10% Final Presentation

Course Project:

Students will work in groups of 2 to 4 on a semester-long project. Projects will involve implementation of a DSP system that processes REAL data and performs some useful function. Coding should be performed in C or C++ using the GNU C++ compiler gcc. Matlab can be used as an alternative.

Each group will make a 15 minute IEEE Conference style presentation at the end of the semester during a “Presentation Day.” The presentation will consist of no more than 10 viewgraphs that must be submitted to the instructor one week in advance of the presentation. Style and format guidelines will be provided later in the semester. A 5 minute question and answer period will be included in the 15-minute presentation.

Each group will be responsible for a written final report following the format of an IEEE Proceedings tutorial paper. These papers are expected to be 30 pages in length including figures. Figures should be included within the text and not be overly large. The format should follow a standard IEEE format (see the IEEE Proceedings for an example).

Students will prepare a three page project proposal by the end of the third week of class. This will describe the system to be implemented, give references, show a statement of work, and indicate the testing methodology to be used. This proposal will be used to judge the success of the final project.

Final Exam:

Open books and notes
Unexcused absences automatically get a zero!
Excused absences require my signature on a written request prior to the exam

Quizzes:

Quizzes can be given without notice, especially when attendance is light. They are generally used in borderline cases — if you miss a quiz, don't expect a miracle at the end of the semester.

References:

see http://isip.msstate.edu/fun_stuff/booklist

(see the comp.dsp FAQ for additional textbooks)

Class	Sects.	Topic
8/18 (1)	1.1-1.3	Introduction (Rules and Procedures, Who Am I?)
8/18 (2)	1.1-1.3	Introduction (Who are you? Demos)
8/20 (3)	1.4,1.5	The Sampling Theorem
8/25 (4)	2.1,2.2	Discrete-Time Signals and Systems
8/25 (5)	2.3	Analysis of LTI Systems
8/27 (6)	2.4,2.5	Difference Equations
9/3 (7)	2.6,2.7	Correlation of Sequences
9/3 (8)	3.1	The z-Transform
9/8 (9)	3.2	Properties of the z-Transform
9/8 (10)	3.3	Rational z-Transforms
9/10 (11)	3.4	Inversion of the z-Transform
9/15 (12)	3.5	The One-Sided z-Transform
9/15 (13)	3.6,3.7	Analysis of LTI Systems
9/17 (14)	**Exam No. 1 (Chaps. 1-3)**	
9/22 (15)	4.1	Frequency Analysis of Continuous-Time Signals
9/22 (16)	4.2	Frequency Analysis of Discrete-Time Signals
9/24 (17)	4.3	Properties of the Discrete Fourier Transform
9/29 (18)	4.4	Frequency Domain Characteristics of LTI Systems
9/29 (19)	4.5	Time-Frequency Duality
10/1 (20)	4.6,4.7	Inversion, Deconvolution, and System Identification
10/6 (21)	5.1	Frequency Domain Sampling
10/6 (22)	5.1	Frequency Domain Sampling
10/8 (23)	5.1	Frequency Response of LTI Systems
10/13 (24)	5.2	The Discrete Fourier Transform and Its Properties
10/13 (25)	5.3	LTI Systems as Filters
10/15 (26)	5.4	Computation of the Frequency Response Function
10/20 (27)	6.1	Efficient Computation of the DFT: The FFT
10/20 (28)	6.2	Other Efficient Computational Forms of the FT
10/22 (29)	7.1,7.2	Structures for the Realizations of Filters
10/27 (30)	7.2	FIR Systems
10/27 (31)	7.3,7.4	IIR Systems
10/29 (32)	**Exam No. 2 (Chaps. 4-6)**	

Class	Sects.	Topic (cont.)
11/3 (33)	7.5	State-Space Analysis
11/3 (34)	7.6-7.9	Quantization and Sensitivity
11/5 (35)	8.1	Design of FIR Filters
11/10 (36)	8.2	Design of IIR Filters From Analog Prototypes
11/10 (37)	8.2	Design of IIR Filters From Analog Prototypes
11/12 (38)	8.3,8.4	Frequency Transformations/Optimization
11/17 (39)	8.4,8.5	Pole/Zero Design of Digital Filters
11/17 (40)	8.5	Weiner Filters
11/19 (41)	9.1	Time-Domain Sampling
11/24 (42)	9.2	A/D Conversion
11/26 (43)	**Exam No. 3 (Chaps. 7-8)**	
12/1 (44)	9.3	D/A Conversion
12/2 (45)	**PRESENTATION DAY - 1:00 PM to 4:00 PM Simrall Auditorium**	
12/3 (46)	10	Signal Interpolation/Decimation
12/11 (47)	**Final 12-3 PM (emphasis on Chaps. 8-9)**	

No.	Due Date	Chapter	Problems
1.	8/25	1	1.1 — 1.6
2.	9/8	2	2.4, 2.5, 2.7, 2.8, 2.17, 2.27, 2.32, 2.45
3.	9/15	2	2.16, 2.28, 2.36, 2.39, 2.48, 2.59, 2.61
4.	9/22	3	3.1, 3.2(a,c,e,g), 3.3(a,c), 3.4(a,b,e,f), 3.12
5.	9/29	3	3.13, 3.18(a,b,c), 3.24, 3.30, 3.35
6.	10/6	4	4.1,4.2,4.8,4.15,4.17,4.35
7.	10/13	4	4.6,4.10,4.22,4.33,4.34
8.	10/20	5	5.1, 5.3, 5.7, 5.11, 5.13,
9.	10/27	5	5.18, 5.19, 5.20, 5.27
10.	11/3	6	6.4, 6.8, 6.11, 6.16
11.	11/10	7	7.4, 7.7, 7.9, 7.10, 7.15
12.	11/17	7	7.19, 7.22, 7.28, 7.32, 7.45
13.	11/24	8	8.1(a,b,c), 8.10, 8.14, 8.15, 8.16
14.	12/2	8	8.18, 8.21, 8.24, 8.25, 8.27
15.	12/2	9	9.1, 9.2, 9.4, 9.5, 9.6