COURSE SYLLABUS: EE583 - ADAPTIVE SIGNAL PROCESSING

Instructor: Dr. Edgar Satorius

1. Introduction

This class meets 6:40 PM - 9:20 PM every Monday evening beginning January 10, 2011 and ending on April 25, 2011. The final exam for this course is on Monday May 9, 2011 from 7-9:00 PM. Our class room will be RTH 115. The grader is Mr. En-Shuo Tsau.

Please note: During this course we will have no classes on the following days:

Jan. 17 Martin Luther King Day, university holiday
Feb. 21 Presidents' Day, university holiday
Mar. 14 Spring recess

Consequently, I will attempt to consolidate some of the material so that I can cover most of the topics in Sections 4-11 – I will see how things go during the course.

Section 4 is mainly a review of material on discrete random processes. Most of this material is covered in EE562a, which is a prerequisite for this course. To do well in this course, you should be thoroughly familiar with this material. If you need to refresh your memory, I suggest you use the 'Probability, Random Variables, and Stochastic Processes' book by Papoulis or the 'Discrete-Time Signal Processing' book (§2.10, App. A) by Oppenheim and Schafer referenced below -- also the course text ('Adaptive Filter Theory' by Haykin; Chps. 2 and 3) has a good review on discrete random processes. Other related courses include: EE563 (Estimation Theory which covers Kalman filters); EE586L (Advanced DSP Design Lab); EE667 (Array Signal Processing) and EE668 (VLSI Processors).

Policy on class attendance for on-campus students: There is no requirement to attend the class in the studio (though I appreciate in-studio attendance as it can get lonely !!!!). The only exception is during the April 25 class when we are doing course evaluations – please plan to attend this class.

2. Grading and Computers

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<tr>
<th>Computer Projects</th>
<th>Final</th>
<th>Homework</th>
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<td>(open book &amp; notes)</td>
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Throughout the semester I will assign 5-6 homework sets plus two or three computer projects. The computer projects will help you learn the course material by conducting practical computer experiments on real world problems. Each project will focus on a reasonably well defined problem so that you can concentrate on learning the techniques - - not coming up with problems. The results of your studies should be well documented in
a report with computer printouts/plots (no source listings required) to justify your conclusions. In doing the computer projects, you can use any computer language you wish; however, I encourage you to consider Matlab – especially if you have experience with it. Matlab is a very simple and powerful language that is particularly suitable for programming signal processing algorithms. It also has a very nice graphical display capability and includes a convenient mechanism for incorporating on-line help into the system. If you do use Matlab, make sure you have the Signal Processing toolbox.

If you do well on the homeworks and the projects, then you will be able to perform well in the class. Do the homeworks on your own (although you are free to discuss the problems with other classmates). Likewise with the computer projects: you can discuss them with others, but write them yourself. The final exam will be an open text/notes exam that will cover selected topics in the course (I will clearly describe what topics will be covered in the final exam prior to the exam).

Policy on late assignment submittals: I will allow late submittals provided you let me know in advance via e-mail. However, once the solutions are posted (typically about a week after the assignments are due), no submittals will be accepted or graded. One other important note regarding assignment submittals for on-campus students: Do not interrupt the class to submit an assignment (I will not accept or grade assignments submitted during the class). You must submit your assignment either before or after class or during the break.

3. Office Hours

My office hours are 5:30-6:40 Mondays in PHE 414. TV students may call me during this time (213 740 7654), or arrange an appointment for Monday evenings. I strongly encourage you to make use of this time to discuss problems with the course material or any related aspects of digital signal processing which interest you. If you can't reach me otherwise, my e-mail address is: Edgar.H.Satorius@jpl.nasa.gov.

Questions related to the homework, projects, Matlab, etc. should initially be addressed to the grader. The grader’s e-mail address is: tsau@usc.edu. If you need to discuss homework problems or the homework grading, make arrangements directly with him. Please make use of our grader – remember: he’s located on-campus and I'm not !.

COURSE OUTLINE:

4. Discrete random processes (Class 1)  
   [Papoulis; O&S-DTSP (§2.10, App. A); Haykin (Chp. 1)]

5. Linear prediction (Classes 1-3)  
[Haykin (Chp. 3)]

[4] Linear prediction lattice filtering.

6. Digital Wiener filtering (Classes 4-5)  
[Haykin (Chp. 2)]


7. Least mean squares adaptive filter (Classes 6-10)  
[Haykin (Chps. 4,5,6,13 and 14)]


8. Orthogonalized adaptive filters (Class 11)  
[Haykin Chps. 7,12]


9. Least squares adaptive filters (Class 12)  
[Haykin (Chps. 8,9,12)]


10. Other adaptive filtering technique (Classes 13)  
[Haykin (Chps. 15,17)]


11. Blind adaptive filtering (Class 14 – time permitting)
REFERENCES:

12.1. Required

[1] Class notes: I have prepared a large amount of supplementary class notes that are required for the course. These will be available at the DEN course website.

12.2. Recommended Reading


12.3. Background Material