Course Information

| Instructors: | Chandra Radhakrishnan | Peter Kairouz |
| Email: | cradhak@illinois.edu | kairouz2@illinois.edu |
| Office Hours: | T: 10:00 AM - 12:00 PM | R: 10:00 AM - 12:00 PM |
| Office: | 120 CSL | 119 CSL |

Lectures: MTWRF, 8:30 AM - 9:50 AM
Everitt Lab 241
Recitation Session: R, 5:00 PM - 6:00 PM
EH 106B6
Web: http://courses.engr.illinois.edu/ece310/

Textbooks

- Required: D. Munson and A. Singer, ECE 310 Course Notes.

Prerequisites

- ECE 210 (Analog Signal Processing) or consent of instructor.

Course Philosophy

Upon completion of this course, you should be able to recognize the terminology that is used in the Digital Signal Processing (DSP) field, explain the theory and concepts behind the construction of DSP systems, and analyze basic DSP building blocks; including analog-to-digital (A/D) and digital-to-analog (D/A) converters, digital filters, spectrum analyzers, sample rate converters (up-sampling and down-sampling), and the fast Fourier transform (FFT) algorithm. This course should give you the necessary tools to design and synthesize these building blocks and use them effectively in applications and evaluate DSP systems and justify choices among alternative designs. The requirement from you, however, is to think critically, ask questions, and apply problem-solving techniques.

Grading

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<tbody>
<tr>
<td>Midterm Exams (2)</td>
<td>40%</td>
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<tr>
<td>Homework (8)</td>
<td>20%</td>
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<tr>
<td>Final Exam</td>
<td>40%</td>
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<td><strong>Total</strong></td>
<td>100%</td>
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- Late assignments will reduce the grade by 20% per day
- There will be two midterm exams. The exam dates and locations are tentatively scheduled as follows: Wednesday, July 6, 2011 and Wednesday, July 27, 2011 at 5:00 PM in EH 106B1.
- All exams are closed-book. However, you can bring one 8.5'×11' sheet of handwritten notes to the exam.
- Final exam is comprehensive; you are allowed to bring two previously handwritten notes (from midterms 1 & 2) in addition to a new one.
<table>
<thead>
<tr>
<th>Week</th>
<th>MATERIALS</th>
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| 1    | DSP overview  
Continuous-time (CT) and discrete-time (DT) signals  
Complex numbers  
Impulses  
Fourier transform (FT)  
Discrete-time Fourier transform (DTFT)  
Discrete Fourier transform (DFT) |
| 2    | DFT spectral analysis  
Sampling  
Ideal A/D (analog-to-digital) converter  
LSI Systems  
Convolution |
| 3    | Impulse response  
Difference equations  
z-transform  
Poles and zeros  
Inverse z-transform |
| 4    | Convolution via z-transform  
System analysis  
BIBO stability  
Frequency response |
| 5    | DT processing of CT signals  
A/D and D/A converters  
Analog frequency response of a digital processor  
Applications of DSP systems |
| 6    | Digital filter structures  
FIR and IIR filters  
Generalized linear phase  
FIR filter design: truncation, windows, min-max, and frequency sampling |
| 7    | IIR filter design  
IIR design via bilinear transformation  
Applications of digital filtering  
Downsampling and upsampling |
| 8    | Oversampling A/D and D/A  
Digital interpolation  
Fast Fourier transforms (FFT)  
Fast convolution  
Applications and review |