EE-4252
Digital Signal Processing and Applications

Curricular Designation: EE: elective  CpE: elective

Catalog Description:
EE 4252 - Digital Signal Processing and its Applications  Digital signal processing techniques with emphasis on applications. Includes sampling, the Z-transform, digital filters and discrete Fourier transforms. Emphasizes techniques for design and analysis of digital filters. Special topics may include the FFT, windowing techniques, quantization effects, physical limitations, image processing basics, image enhancement, image restoration and image coding.
Credits: 4.0  Lec-Rec-Lab: (0-3-2)  Semesters Offered: Fall  Pre-requisites: EE 3160 and EE 2150

Textbooks(s) and/or Other Required Materials:

Prerequisites by Topic:
1. Familiarity with the Fourier analysis of analog periodic signals.
2. Familiarity with the Laplace transform and Fourier transform of analog signals.
3. Introduction to FIR and IIR filters and their response.

Course Objectives:
1. Mastery of the analysis of digital filters by the Z-transform.
3. Mastery of the FFT of sinusoids and familiarity with spectrum analysis of sampled signals.
4. Mastery of the window method of FIR filter design and familiarity with the design of FIR filters by other methods.
5. Mastery of the bilinear transform method of IIR filter design and familiarity with the design of IIR filters by other methods.

Topics Covered:
1. Time domain analysis of digital filters by convolution and solution of difference equations.
2. The Z-transform, its properties and its applications to the analysis of digital filters.
4. The Discrete Fourier Transform (DFT), Fast Fourier Transform (FFT) and its applications.
5. Design of IIR digital filters.

Relationship of Course Content to Program Outcomes:

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Topics and Level of Coverage</th>
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<tbody>
<tr>
<td>a</td>
<td>an ability to apply knowledge of mathematics, science and engineering</td>
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<tr>
<td>b</td>
<td>an ability to design and conduct experiments, as well as to analyze and interpret data</td>
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<td>c</td>
<td>the ability to design a system, component, or process to meet desired needs within realistic constraints such as...</td>
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<td>d</td>
<td>an ability to function on multi-disciplinary teams</td>
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<td>e</td>
<td>an ability to identify, formulate and solve engineering problems</td>
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<td>f</td>
<td>an understanding of professional and ethical responsibility</td>
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<td>g</td>
<td>an ability to communicate effectively</td>
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<tr>
<td>h</td>
<td>the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context</td>
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<tr>
<td>i</td>
<td>a recognition of the need for, and an ability to engage in life-long learning</td>
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<td>j</td>
<td>a knowledge of contemporary issues</td>
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<td>k</td>
<td>the ability to use the techniques, skills, and modern engineering tools necessary for the practice of electrical engineering</td>
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Contribution of Course to Meeting Degree Requirements:
4 Credit Hours – Engineering Topics

Class/Laboratory Schedule (note: 1 hour = 50 minutes):
Recitation: 42 hours = 3 hours/week for 14 weeks
Lab: 28 hours = 2 hours/week for 14 weeks

Prepared by:
Ashok Ambardar, Associate Professor, Sep 22, 2009