Prof. Dr. Fahreddin M. Sadıkoğlu

Electrical Engineering Department

Digital Signal Processing - E E 461

Course Description:

Typical Digital Signal Processing Operations. Sampling. Typical Digital Signal Processing Operations. Time and Transform Domains Representation of Signals. Z -Transforms. DTFT, FFT. Linear Convolution. Correlation. Z -Transforms. Digital Processing of CTS. Sampling. FIR Filters. Realization principles. Design FIR using windowing. Hamming, Hanning, Blackman and Kaiser windows. IIR Filters. Realization principles. Impulse invariant, pole-zero placement and BZT design methods.

Finite Wordlength Effect in digital filters

Multirate DSP. Upsampling and downsampling. Decimation & Interpolation Systems. Introduction to adaptive filters. Introduction to wavelet.

Course Grade Determination:

Grade=15%(Homework)+15%(Laboratory) + 30%(Midterm)+ 40(Final Exam)

Textbook

1. Sanjit K. Mitra. Digital Signal Processing. A computer based approach. McGraw-Hill, 1998

References

2. Oppenheim A. V., and Schafer, W. R. Discrete Time Signal Processing. 2nd ed. Englewood Cliffs, N. J.: Prentice-Hall, 1999

3. Emmanuel C. Ifeachor, Barrie W. Jervis. Digital Signal Processing. Englewood Cliffs, N. J.: Prentice-Hall, 2001

4. Raghuverer M. Rao, Ajit S. Bopardikar. Wavelet Transforms: Introduction: Theory & Applications. Addisson-Wesley, 1998

5. Antoniou A. Digital Filters: Analysis and Design. New York: McGraw-Hill , 1979

6. Gold B., and Reader Ch. M. Digital Processing of Signals.. New York: McGraw-Hill, 1969

7. McGillem D. P., and Cooper G.R. Continues and Discrete Signal and System Analysis. New York: Holt Rinehart & Winston, 1984

8. Rabiner L. R., and Gold B. Theory and Application of Digital Signal Processing. Englewood Cliffs, N.J.: Prentice-Hall, 1989

9. Ziemer R., Tranter W., and Fanner D. Signals and Systems: Continues and Discrete. New York: Macmillan, 1983

10. Fakhrraddin M. Sadıkoğlu. Signals, Systems and Transforms. NEUPress, Lefkoşa 2002.

Weekly Schedule

Week	Subject	References
1	Signals. Typical Digital Signal Processing Operations	[1], pp.2-41 [2], pp.8-21
2	Time-Domain Representation of Discrete Time- Signals and Systems. Operation on Sequences. Sampling. Time Domain Characterisation of LTI Systems.	[1], pp.48-91 [2], pp.8-27
3	Transform Domain Representation of Signals. DTFT. Linear Convolution and correlation.	[1], pp.68-97 [2], pp.8-27
4	Z -Transform. ROC. The Inverse Z -Transform.	[1], pp.122-178 [2], pp.149-188
5	Digital Processing of CTS. Sampling. Anatog to Digital, Digital to Analog Converters. Recoustruction Filters.	[1], pp.283-330 [2], pp.80-112
6	Analog Filters Design.	[1], pp.341-351
7	Basic Structures. Block Diagram Representations.	[2], pp.290-350
8	FIR Filters. Design . Specification. Coefficient Calculation Methods. Window Method. Optimal Method. Frequency Response Method. Realization of FIR. Design Exampels. Finite Wordlength Effect.	[1], pp.352-397 [2], pp.403-464
9	IIR Filters. Specification. Coefficient Calculation Methods. Pole-Zero Placement. Impulse Invatiant Method. Bilinear Z- Transform. Matched Z-Transform. Finite Wodlength effect. Design Exampels.	[1], pp.417-487 574-643 [2], pp.481-487
10	Multirate Digital Signal Processing. Sampling Rate Alteration. Decimation & Interpolation Systems. Decomposition. Digital Filter Banks.	[1], pp.655-724
11	Applications of DSP. DTMF Detection. Spectral Analysis Using DFT. Speech Processing. Digital FM Steres. Subbang Coding.	[1], pp.741-820 [2], pp.695-472
12	Discrete Hilbert transform. Homomorphic deconvolution.	[2], pp.662-676 786-815
13	Adaptive Digital Filters. Adative RMS, LMS Algoritms. Filters Configuration. Adaptive Filters Applications.	[3], pp.646-680
14	Wavelet Transform. Contious And Discrete Time Wavelet Transforms. Denoising And Signal Compression.	[4], pp.5-48