Digital Signal Processing
Code : EI 605A(ECE)
Contacts : 3L
Credits : 3

MODULE – I:
Discrete-time signals:
Concept of discrete-time signal, basic idea of sampling and reconstruction of signal, sampling theorem, sequences – periodic, energy, power, unit-sample, unit-step, unit-ramp, real & complex exponentials, arithmetic operations on sequences. [3L]

LTI Systems:
Definition, representation, impulse response, derivation for the output sequence, concept of convolution, graphical, analytical and overlapped methods to compute convolution supported with examples and exercises, properties of convolution, interconnections of LTI systems with physical interpretations, stability and causality conditions, recursive and non-recursive systems. [6L]

MODULE –II:
Z-Transform:
Definition, mapping between s-plane and z-plane, unit circle, convergence and ROC, properties of Z-transform, Z-transform on sequences with examples and exercises, characteristic families of signals along with ROCs, convolution, correlation and multiplication using Ztransform, initial value theorem, Perseval's relation, inverse Z-transform by contour integration, power series & partial-fraction expansions with examples and exercises. [6L]

Discrete Fourier Transform:
Concept and relations for DFT/IDFT, Twiddle factors and their properties, computational burden on direct DFT, DFT/IDFT as linear transformations, DFT/IDFT matrices, computation of DFT/IDFT by matrix method, multiplication of DFTs, circular convolution, computation of circular convolution by graphical, DFT/IDFT and matrix methods, linear filtering using DFT, aliasing error, filtering of long data sequences –Overlap-Save and Overlap-Add methods with examples and exercises. [5L]

Fast Fourier Transform:
Radix-2 algorithm, decimation-in-time, decimation-in-frequency algorithms, signal flow graphs, Butterflies, computations in one place, bit reversal, examples for DIT & DIF FFT Butterfly computations and exercises. [4L]

MODULE –III:
Filter Design:
Basic concepts of IIR and FIR filters, difference equations, design of Butterworth IIR analog filter using impulse invariant and bilinear transforms, design of linear phase FIR filters, no. of taps, rectangular, Hamming and Blackman windows. [5L]

MODULE –IV:
Digital Signal Processor:
Elementary idea about the architecture and important instruction sets of TMS320C 5416/6713 processor, writing of small programs in Assembly Language. [4L]

FPGA:
Architecture, different sub-systems, design flow for DSP system design, mapping of DSP algorithms onto FPGA. [3L]

TEXT BOOKS:
1. Digital Signal Processing –Principles, Algorithms and Applications, J.G.Proakis & D.G.Manolakis, Pearson Ed.
2. Digital Signal processing –A Computer Based Approach, S.K.Mitra, TMH Publishing Co.
3. Digital Signal Processing Signals, Systems and Filters, A. Antoniou, TMH Publishing Co.
4. VLSI Digital Signal Processing Systems Design and Implementation, Wiley International Publication.
5. Digital Signal Processing with Field Programmable Gate Arrays, U.Meyer-Baese, Springer.

REFERENCE BOOKS:
1. Digital Signal Processing, P. Rameshbabu, Scitech Publications (India).
2. Digital Signal Processing, S.Salivahanan, A.Vallabraj & C. Gnanapriya, TMH Publishing Co.
3. Digital Signal Processing; A Hands on Approach, C. Schuler & M.Chugani, TMH Publishing Co.
4. Digital Signal Processing, A. Nagoor Kani, TMH Education
5. Digital Signal Processing S. Poornachandra & B. Sasikala, MH Education
6. Digital Signal Processing; Spectral Computation and Filter Design Chi-Tsong Chen, Oxford University Press
7. Texas Instruments DSP Processor user manuals and application notes.
8. Xilinx FPGA user manuals and application notes.
9. Digital Signal Processing: A MATLAB-Based Approach, V.K.Ingle and J.G.Proakis, Cengage Learning
10. Modern Digital Signal Processing,V. Udayashankara, PHI Learning