ADVANCED DIGITAL SIGNAL PROCESSING
(ELECTIVE – I)

Course Code:13EE2206 **L P C**
4 0 3

Pre requisites: Signals and Systems and Digital Signal Processing.

Course Outcomes: At the end of the course, the student will be able to
CO1: Demonstrate realization of different structures of IIR and FIR Filters.
CO2: Describe Spectral transformations of IIR filters
CO3: Design computationally efficient FIR digital filters
CO4: Identify Quantization process, arithmetic round off and signal-to-noise ratio in low order IIR filters
CO5: Analyze errors and Estimate power spectrum using various methods

UNIT-I
DIGITAL FILTER STRUCTURES:
Block diagram representation-Equivalent Structures- IIR digital filter Structures All Pass Filters-tunable IIR Digital Filters-IIR tapped cascaded Lattice Structures--Computational complexity of digital filter structures.
Block diagram representation- Equivalent structure- FIR digital Filter Structures FIR cascaded Lattice Structures – Parallel- Digital Sine cosine generator-Computational complexity of digital filter structures.

UNIT-II
IIR DIGITAL FILTER DESIGN
Preliminary considerations-Bilinear transformation method of IIR filter design-design of Low pass, high pass, Band pass, and Band stop- IIR digital filters-Spectral transformations of IIR filters.

UNIT-III
FIR DIGITAL FILTER DESIGN
FIR filter design-based on Windowed Fourier series- computer aided design of Equiripple Linear Phase FIR filters- design of minimum phase FIR filters- design of computationally efficient FIR digital filters

UNIT-IV

DSP ALGORIRHM AND FINITE WORD LENGTH EFFECTS

Computation of the discrete Fourier transform- Number representation-Arithmetic Operations-handling of overflow-Tunable digital filters-function approximation.

The Quantization process and errors- Quantization of fixed -point and floating –point Numbers-Analysis of coefficient Quantization effects - Analysis of Arithmetic Round-off errors-Dynamic range scaling signal-to- noise ratio in Low -order IIR filters-Low-Sensitivity Digital filters

UNIT- V

ERRORS ANALYSIS AND POWER SPECTRUM ESTIMATION

Reduction of Product round-off errors using error feedback-Limit cycles in IIR digital filters- Round-off errors in FFT Algorithms.

Estimation of spectra from Finite Duration Observation of signals – Non-parametric methods for power spectrum Estimation–parametric method for power spectrum Estimation-Estimation of spectral form-Finite duration observation of signals-Non-parametric methods for power spectrum estimation-Welch methods-Blackman & Tukey method.

TEXT BOOKS:

1. Sanjit K. Mitra , "*Digital signal processing*",2nd Edn, TMH, 1997 (UNITS – I, II, III, IV)

2. John G.Proakis, "Digital *Signal Processing principles, algorithms and Applications*", 3rd Edn. PHI, 2002. (UNITS – V)

REFERENCE BOOKS:

1. Alan V.Oppenheim, Ronald W.Shafer, "*Discrete Time Signal Processing*", 1st Edition. PHI, 1996.
2. S.Salivahanan, A.Vallavaraj, C. Gnanapriya , "*Digital Signal Processing* ", 2nd Edition, TMH, 2001
3. Lourens R. Rabinar & Bernard Gold, "*Theory and Applications of Digital Signal Processing*", 2nd Edition, TMH, 2001
4. Andreas Antoniou,"*Digital Filter Analysis and Design*", TMH, 2001