PVP 22

ADVANCED DIGITAL SIGNAL PROCESSING

22ECMC1T1   **Credits: 4**
Lecture: 4 periods/week   **Internal assessment: 40 marks**
                                               Semester end examination: 60 marks

Prerequisites: Digital signal processing

Course outcomes:

At the end of the course Student will be able to

- Design a sample rate converter that reduces/increase by a given factor.
- Analyze and synthesize FIR filter for given multi structure filter bank
- Evaluate the optimum reflection coefficients for the lattice forward and backward predictors.
- Analyze the concepts of wavelet transforms and apply them for the analysis of image signals

UNIT – I

MULTIRATE DIGITAL SIGNAL PROCESSING

Introduction, Up sampler, Down sampler, Decimation by a factor D, Interpolation by a factor I, Sampling Rate Conversion by a Rational Factor I/D, Implementation of Sampling Rate Conversion: Polyphase Filter Structures, Interchange of Filters and Down samplers/Up samplers, Sampling Rate Conversion with Cascaded Integrator Comb Filters, Polyphase Structures for Decimation and Interpolation Filters, Structures for Rational Sampling Rate Conversion.

UNIT – II

MULTIRATE SIGNAL PROCESSING APPLICATIONS

Multistage Implementation of Sampling Rate Conversion, Sampling rate conversion by Bandpass signals, Sampling rate conversion by an arbitrary factor, Design of Phase Shifters, Interfacing of Digital Systems with Different Sampling Rates, Implementation of Narrowband Lowpass Filters, Subband Coding of Speech Signals, Digital Filter Banks , Two channel Quadrature Mirror Filter Bank

UNIT – III

LINEAR PREDICTION

Forward and Backward Linear Prediction – Forward Linear Prediction, Backward Linear Prediction, Optimum reflection coefficients for the Lattice Forward and Backward Predictors. Solution of the Normal Equations: Levinson Durbin Algorithm, Schur Algorithm. Properties of Linear Prediction Filters.

UNIT – IV

POWER SPECTRUM ESTIMATION

Estimation of spectra from finite duration observation of Signals, Non parametric methods for power spectrum estimation, Parametric methods for power spectrum estimation, Filter bank methods**.**

Learning Resources

Text Books:

1. J.G.Proakis & D.G.Manolokis Digital Signal Processing: Principles, Algorithms & Applications , 4th Ed., PHI.(Units-I, II, & III)
2. K.P. Soman and K.I Ramachandran,N.G.Resmi "Insight into Wavelets from Theory to Practice",3rd Ed., Eastern Economy Edition May 2011 (Unit IV)

Reference Books:

1. P.P.Vaidyanathan "Multirate Systems and Filter Banks" Pearson Education
2. S.Salivahanan, A.Vallavaraj, C.Gnanapriya "Digital Signal Processing" , 2000,TMH
3. Jaideva C.Goswami, Andrew K. Chan, Fundamentals of Wavelets Theory, Algorithms and Applications, John Wiley & Sons, 2nd Ed., 2009.
4. Raghuveer M. Rao, Ahit S.Bopardikar, Wavelet Transforms - Introduction to Theory and Applications, Pearson Education Asia, 1999.

E-Resources

1. https://nptel.ac.in/courses/108105055/
2. http://nptel.iitm.ac.in/courses/Webcourse- contents/ IITKANPUR/ Digi_Sign_Pro/ ui/ TOC.htm