

**OBJECTIVE**

This course provides the idea on design of analog and digital filters, and their classifications. Also, it provides a good knowledge of error correction in signal processing systems, which is then enriched with the applications to the image and speech processing.

**UNIT – I SIGNALS AND SYSTEMS 9**

Basic elements of DSP – concepts of frequency in Analog and Digital Signals – sampling theorem – Discrete – time signals, systems – Analysis of discrete time LTI systems – Z transform – Convolution – Correlation.

**UNIT – II FREQUENCY TRANSFORMATIONS 9**

Introduction to DFT – Properties of DFT – Circular Convolution - Filtering methods based on DFT – FFT Algorithms - Decimation – in – time Algorithms, Decimation – in – frequency Algorithms – Use of FFT in Linear Filtering – DCT – Use and Application of DCT.

**UNIT – III IIR FILTER DESIGN 9**

Structures of IIR – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – (LPF, HPF, BPF, BRN) filter design using frequency translation

**UNIT – IV FIR FILTER DESIGN 9**

Structures of FIR – Linear phase FIR filter – Fourier Series - Filter design using windowing techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency sampling techniques – Finite word length effects in digital Filters: Errors, Limit Cycle, Noise Power Spectrum.

**UNIT – V APPLICATIONS 9**

Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor – Adaptive Filters: Introduction, Applications of adaptive filtering to equalization, echo cancellation, interference cancellation – Speech Recognition Systems, Speech Synthesis Systems – Image Enhancement.

**TOTAL: 45****TEXT BOOKS:**

1. John G. Proakis & Dimitris G. Manolakis, "Digital Signal Processing – Principles, Algorithms & Applications", Pearson education / Prentice Hall, Fourth edition, 2007.

2. Emmanuel C. Ifeachor, & Barrie.W.Jervis, "Digital Signal Processing", Pearson Education / Prentice Hall, Second edition, 2002.

### **REFERENCES:**

1. Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", Tata McGraw Hill, Third Edition, 2007.
2. Alan V. Oppenheim, Ronald W. Jchafer & Hohn. R. Back, "Discrete Time Signal Processing", Pearson Education, Second Edition, 2001.
3. Andreas Antoniou, "Digital Signal Processing", Tata McGraw Hill, 2006.