C-DAC &Gujarat Technological University
M.E. Electronics & Communication Engineering
(VLSI & Embedded Systems Design)
Gandhinagar

Semester: I

Subject Name: Digital Signal Processing

Subject Code: 2715203

UNIT – I
Signals and Signal processing, Classification of signals; Examples of typical signals; Signal applications; Causality, Stability. Discrete time signals; The sampling process; Characterization of linear time-invariant systems; Convolution and its properties; Difference equations.

UNIT – II
The Discrete Fourier Transform, The discrete-time Fourier transform; Discrete Fourier transform and its properties; Linear convolution; Fast Fourier transform; z-transform and inverse z-transform.

UNIT – III
Linear Time-Invariant Discrete Systems in the Transform Domain, Finite dimensional discrete systems; Transfer function; Simple digital filters; Inverse systems; Linear phase filters; Chebyshev's theorem, Remez algorithm.

UNIT – IV
Digital Processing of Continuous-Time Signals, Sampling of continuous-time signals; Paley-Wiener theorem; Nyquist frequency; Kotelnikov-Shenon's theorem; Analog low pass filter design; Design of analog high pass; Band pass and band shop filters; Analog - to - digital converter; Digital- to-Analog converter.

UNIT – V
Digital Filter Structures, Block diagram representation; Basic finite and infinite impulse response (FIR & IIR); Digital filter structures; All pass filters; IIR tapped cascaded lattice structure; FIR cascaded lattice structure; Digital sine-cosine generator. Preliminary considerations; Bilinear transformation method of IIR filter design; Design of low pass; High pass; Band pass; Band shop IIR digital filters; Spectral transformations of IIR digital filters; FIR filter design based on Windowed Fourier series; Design of FIR digital filters with least-mean-square error; Digital IIR filters design; Analog filters - Bessel, Butterworth, Chebyshev, elliptic filters.

Labs:
Matlab/Octave/Python package tools are used and applied during laboratory exercises.
Units include:
Discrete-time IIR filter design
Analog filter Design (Buttterwoth, chebyshev, elliptic lowpass filters)

Analog-to-digital lowpass transformations
Frequency-band transformations

Course Project:
A project of suitable complexity, comprising of program design, coding, compilation and debug must be completed.

Reference:

1. Digital Signal Processing A Practical Guide for Engineers and Scientists by Steven Smith, Elsevier publication
2. Digital Signal Processing Fundamentals & Applications by Li Tan, Elsevier publication