

Devi Ahilya University, Indore, India Institute of Engineering & Technology				ME – I Year (Spl Digital Communication) Semester- A			
Subject Code & Name	Instructions Hours per Week			Credits			
	L	T	P	L	T	P	Total
DCP1G3 Advance Digital Signal Processing	3	1	2	3	1	1	5
Duration of Theory Paper: 3 Hours							

**Course Objective:** To provide clear conceptual knowledge of different DSP algorithms and to introduce speech, multimedia and other signal processing applications.

**Prerequisite(s):** A basic course in Digital signal processing.

### COURSE CONTENTS

#### Unit 1

Overview of DSP, FIR filters, IIR filters, design techniques of linear phase FIR filters, IIR filters by impulse invariance, bilinear transformation, Linear prediction & optimum linear filters stationary random process, forward- backward filters linear prediction, solution of normal equation.

#### Unit2

Multi rate DSP, Sampling rate conversion, poly phase filters, multistage decimator & interpolator, QMF, digital filter banks, DFT in spectral estimation., Adaptive filters & spectral estimation.

#### Unit 3

Minimum mean square criterion, , LMS algorithm, Recursive least square algorithm, Application of DSP & Multi rate DSP Application to Radar, introduction to wavelets, application to image processing, design of phase shifters, DSP in speech processing & other applications

#### Unit 4

Image representation : Gray scale and color images , image sampling and quantization. Image enhancement: Filter in spatial and frequency domains , histogram based processing and homomorphic filtering. Edge Detection edge linking, boundary descriptors. Image Segmentation : Thresholding, region based segmentation Image Compression: lossy and lossless compression techniques.

#### Unit 5

Entropy coding, lossy and lossless predictive coding, uniform and non uniform quantizers, transform based compression, JPEG, Image reconstruction from projections: Principles, mathematical basis of tomography. Projections, The Fourier Slice Theorem, Reconstruction Algorithms for Parallel Projections, Three dimensional projections. Computer visualization of 3D data : Rendering techniques: Surface based and volume based techniques. Direct Volume rendering: Ray casting, opacity function. Maximum Intensity Projection

#### BOOKS RECOMMENDED:

- [1]. Gonzalez and Woods : Digital Image Processing, Pearson Education 3rd Edition
- [2]. A.K.Jain : Fundamentals of Digital image processing , PHI
- [3]. J.G. Proakis and D.G .Manolakis Digital signal processing: Principles, algorithm and applications, Macmillan publishing
- [4]. Ifeachor E.C., Jervis B.W. Digital signal processing, a Practical approach, 2nd ed. Pearson edu. 2003.
- [5]. Salivahanan, Vallavaraj & Gnanpriya Digital signal processing:: Tata Mcgraw Hill
- [6]. References:
- [7]. S.W.Smith Digital signal processing: A practical guide for engineers and scientists, Elsevier
- [8]. S.K.Mitra , Digital signal processing:: Tata Mcgraw Hill