**EC2314 DIGITAL SIGNAL PROCESSING** **L T P C**
**3 1 0 4**

**UNIT-I INTRODUCTION** **9**

Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect. Digital signal representation.

**UNIT- II DISCRETE TIME SYSTEM ANALYSIS** **9**

Z-transform and its properties, inverse z-transforms; difference equation – Solution by z transform, application to discrete systems - Stability analysis, frequency response – Convolution – Fourier transform of discrete sequence – Discrete Fourier series.

**UNIT –III DISCRETE FOURIER TRANSFORM & COMPUTATION** **9**

DFT properties, magnitude and phase representation - Computation of DFT using FFT algorithm – DIT & DIF - FFT using radix 2 – Butterfly structure.

**UNIT –IV DESIGN OF DIGITAL FILTERS** **9**

FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics. IIR design: Analog filter design - Butterworth and Chebyshev approximations; digital design using impulse invariant and bilinear transformation - Warping, prewarping – Frequency transformation.

**UNIT –V DIGITAL SIGNAL PROCESSORS** **9**

Introduction – Architecture – Features – Addressing Formats – Functional modes - Introduction to Commercial Processors.

**L = 45 T = 15 TOTAL = 60**

**TEXT BOOKS**


1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, 2003 / PHI.
2. S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', Tata McGraw Hill, New Delhi, 2001.


**REFERENCES**


1. B.Venkataramani,M.Bhaskar,'Digital Signal processors',-Architecture, programming & applications-2007.
2. S.Salivahanan, A.Vallavahan, C. Gnanapriya."Digital Signal processing",2008

## EC2314 DIGITAL SIGNAL PROCESSING

### DESCRIPTION :

Signal processing is a technology that spans an vast spectrum of disciplines including entertainment, communication, robotics, space exploration, medicine, seismology, just to name a few. Sophisticated signal processing algorithms and hardware are prevalent in a wide range of systems, from highly specialized military systems through industrial applications to consumer electronics. The present course covers the concepts and techniques of modern digital signal processing which are fundamental to all the above applications. The course starts with a detailed overview of discrete-time signals and systems, representation of the systems by means of differential equations, and their analysis using Fourier and z-transforms. The sampling theory of continuous-time signals is explained next, followed by exploring the transform-based analysis of linear time-invariant (LTI) systems and their structures. Subsequently, the notion of discrete Fourier transform is introduced, followed by an overview of fast algorithms for its computation. The methods for spectral analysis of discrete-time signals are discussed next. Finally, principal methods for design of FIR and IIR filters are covered, followed by a discussion of their use for construction of filter banks as the first step into the theory of wavelet analysis. More detailed description of the course is available here.The course emphasizes understanding and implementations of theoretical concepts, methods and algorithms.

### AIM

To introduce the concept of analyzing discrete time signals & systems in the time and frequency domain.

### OBJECTIVES

- To classify signals and systems & their mathematical representation.
- To analyze the discrete time systems.
- To study various transformation techniques & their computation.
- To study about filters and their design for digital implementation.
- To study about a programmable digital signal processor & quantization effects.

# MICRO LESSON PLAN

| Week | Hour | LECTURER TOPCS | Text/ Reference Books |
|---|---|---|---|
| | | **UNIT I –INTRODUCTION** | |
| I | 1 | Classification of systems: discrete, linear, causal, stable. | R2 |
| | 2 | Dynamic, recursive, time variance systems | R2 |
| | 3 | Classifications of signals: continuous and discrete . | T1 |
| | 4 | Energy and power | T1 |
| | 5 | Mathematical representation of signals.(AV) | T1 |
| | 6 | Spectral density, Sampling techniques. | T1 |
| II | 7 | Quantization, Quantization error. | T1 |
| | 8 | Nyquist rate, Aliasing effect. | T1 |
| | 9 | Digital Signal representation | T1 |
| | 10,11,12 | Problems | T1 |
| | | **UNIT II –DISCRETE TIME SYSTEM ANALYSIS** | |
| III | 13 | Z-Transform and its properties | T1 |
| | 14 | Inverse z-transform | T1 |
| | 15 | Difference equation | T1 |
| | 16 | Solution by z-transform, Application to discrete systems | R2 |
| | 17 | Stability analysis. .(AV Class) | R2 |
| | 18 | Frequency response | R2 |
| IV | 19 | Convolution | R2 |
| | 20 | Fourier transform of discrete sequence | R2 |
| | 21 | Discrete Fourier series | R2 |
| | 22,23,24 | Problems | T1 |
| | | **UNIT III - DISCRETE FOURIER TRANSFORM & COMPUTATION** | |
| V | 25 | DFT properties. | R2 |

| | | | |
|---|---|---|---|
| | 26,27 | Magnitude and phase representation | R2 |
| | 28,29 | Computation of DFT using FFT algorithm. | R2 |
| VI | 30 | DIT | R2 |
| | 31 | DIF | R2 |
| | 32 | FFT using radix 2, | R2 |
| | 33 | Butterfly structure. (AV), | R2 |
| | 34 | Problems | |
| VII | 35,36 | Problems | T1 |
| | **UNIT IV –DESIGN OF DIGITAL FILTERS** | | |
| | 37 | FIR& IIR filter realization, Parallel& Casade forms | R2 |
| | 38,39 | FIR design, Windowing techniques, Need and choice of windows | R2 |
| VIII | 40 | Linear phase characteristics.(AV), IIR design, Analog filter design | R2 |
| | 41,42,43 | Butterworth& Chebyshev approximations | R2 |
| | 44 | Digital design using impulse invariant, Bilinear transformations | R2 |
| IX | 45 | Warping, Prewarping, Frequency transformation | R2 |
| | 46,47,48 | Problems | T1 |
| | **UNIT V – DIGITAL SIGNAL PROCESSORS** | | |
| | 49 | Introduction | R1 |
| | 50 | Architecture | R1 |
| X | 51,52 | Features | R1 |
| | 53,54 | Addressing formats | R1 |
| | 55 | Functional modes | R1 |
| XI | 56 | Introduction to commercial processors.(AV Class) | R1 |
| | 57 | Introduction to commercial processors.(AV Class) | R1 |
| | 58,59,60 | Problems | T1 |

**Prepared by: Mrs. S.Malathi, Asst. Prof. / EEE.**