III B.TECH- I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
Code: R20EC3103	DIGITAL SIGNAL PROCESSING						

COURSE OBJECTIVES:

1. Make Enhance the analytical ability of the students in the area of signal processing.
2. Develop ability among students to observe the response of the discrete time systems for different types of discrete time sequences.
3. Demonstrate basic knowledge of Digital Signal Processing by understanding various transformations.
4. Understand different types of filters (analog/digital) and their designs.
5. Design DSP systems which are used in the area of communications and networking.

COURSE OUTCOMES: After completion of the course, the student will be able to

CO1: Analyze the signals and system in Time and Frequency domain through transformations. **[K4]**
CO2: Solve DFT and IDFT coefficients of a given discrete time sequence using FFT algorithm**. [K3]**
CO3: Examine the significance of various filter structures and responses. **[K3]**
CO4: Construct the digital filter circuits for generating desired signal wave shapes. **[K4]**
CO5: Inspect the performance of a variety of windowing techniques. **[K3]**

SYLLABUS:

UNIT-I: INTRODUCTION

Review of Discrete Time Signals: Some Elementary Discrete-Time Signals, Classification of Discrete–Time Signals, Simple Manipulations of Discrete–Time Signals, Discrete Time Systems: Input-Output Description of Systems, Block Diagram Representation of Discrete-Time Systems and Classification of Discrete-Time Systems, Frequency domain representation of Discrete Time Signals and Systems, Discrete-Time Fourier Transform (DTFT): Existence of DTFT, properties of DTFT.

UNIT-II: DISCRETE FOURIER SERIES & DISCRETE FOURIER TRANSFORMS

Discrete Fourier series: Properties of Discrete Fourier Series, DFS representation of periodic sequences. DFT: Properties of DFT, Computation of DFT, Circular & Linear Convolution of Sequences using DFT. FAST FOURIER TRANSFORMS: Radix-2 Fast Fourier Transforms (FFT), Decimation in Time and Decimation in Frequency FFT Algorithms and Inverse FFT. Review of Z-Transforms

UNIT-III: REALIZATION OF IIR & FIR FILTERS

Block Diagram Representation of Linear Constant Coefficient Difference Equations. Basic structures of IIR systems: Direct form-I realization, Direct form-II realization, transposed, cascade form, parallel form. Lattice structures of IIR systems, Conversion from Lattice structure to direct form and vice-versa. Basic structures of FIR systems: Transversal structure, linear phase, Lattice structure, Polyphase Lattice structures of FIR systems, Conversion from Lattice structure to direct form and vice-versa.

UNIT-IV: IIR DIGITAL FILTERS

Analog filters approximations: Butterworth and Chebyshev, Design of IIR digital filters from analog filters, Design examples, Frequency Transformations in Analog Domain: Low pass to Low pass filter, Low pass to High pass filter, Low pass to Band pass filter, and Low pass to Band stop filter. Frequency Transformations in digital domain: Low pass to Low pass filter, Low pass to High pass filter, Low pass to Band pass filter, and Low pass to Band stop filter.

UNIT-V: FIR DIGITAL FILTERS

Characteristics of FIR Digital Filters, Frequency Response. Design of FIR Digital Filters Using Window Techniques: Rectangular Window, Triangular or Bartlett Window, Raised Cosine Window Hanning Window, Blackman Window, Kaiser Window, Frequency Sampling Technique: Frequency Sampling Realization, Frequency Response, Design, Comparison of IIR and FIR filter.

TEXT BOOKS:

1. John G. Proakis, Dimitris G. Manolakis, ―Digital signal processing, principles, Algorithms and applications, 4th Edition, Pearson Education/PHI, 2007.
2. A.V. Oppenheim and R.W. Schaffer, ―Discrete Time Signal Processing‖, 2nd Edition, PHI, 2008.

REFERENCE BOOKS:

1. Ramesh Babu, ―Digital Signal Processing‖, SciTech Publications, 2011.
2. Andreas Antoniou, ―Digital signal processing‖, TATA McGraw Hill, 2006.
3. R S Kaler, M Kulkarni,, Umesh Gupta, ―A Text book on Digital Signal processing‖, I K International Publishing House Pvt. Ltd, 2010.
4. M H Hayes, Schaum‘s outlines, ―Digital signal processing‖, TATA Mc-Graw Hill, 2007.