

Year & Sem: E2S2	Course Code: EC2204	Course Name: Digital Signal Processing	No. of Credits: 4	L 2	T&PS 2	P 0
Unit-I: Introduction: Characterization and classification of signals, Typical signal Processing Operations, Basic elements of Digital Signal Processing (DSP), advantages of DSP over Analog Signal Processing, The Concept of Frequency in Continuous-Time and Discrete-Time Signals, Digital Signal Processing Vs Discrete Signal Processing Sampling and Reconstruction of continuous time signals: Periodic sampling, Sampling theorem: Pre- filtering to avoid aliasing, Frequency domain representation of sampling, Reconstruction of a band limited signal from its samples, Sampling of bandpass signals, Discrete- time processing of Continuous time signals Unit-II: Discrete time Signals in time domain: Time domain representation of discrete time signals, some basic Sequences, Basic Operations on sequences including Sampling rate alteration, Classification of sequences Discrete Time Systems (DTS) in time domain: Discrete time system examples, Classification of Discrete-time systems, Time domain characterization of LTI DTS: Convolution sum, Impulse & Step Responses, Simple Interconnection schemes, Linear Constant Coefficient Difference Equations (of Finite- dimensional LTI DTS), Classification of LTI DTS: FIR & IIR, Recursive, & Non-recursive Unit-III: Discrete Time Fourier transform (DTFT): Representation of sequences by DTFT, Symmetry properties of the DTFT, DTFT theorems, Frequency domain characterizations of LTI Discrete time systems Discrete Fourier transform (DFT): The Fourier transform of periodic signals, Sampling the Fourier transform, The DFT and its properties, Circular and linear convolution using the DFT. Unit-IV: Fast Fourier Transform: Efficient computation of the DFT, Goertzel algorithm, Decimation in-Time FFT algorithm, Decimation-in-Frequency FFT algorithm Z-Transforms: Rational Z-Transforms, Region of convergence of the ZT, and its properties, the inverse Z-Transform, The Transfer Function and Frequency response from Transfer function Unit-V: IIR Digital Filters: Analog filter approximations: Butterworth and Chebyshev Filters, Design of Digital IIR filters from Analog filters: Impulse Invariant Transformation & Bilinear Transformation, Analog and Digital frequency transformations FIR Digital Filters: Characteristics and frequency response of FIR Digital Filters, Design of FIR Digital Filters: Windowing method, Frequency sampling method. Unit-VI: Digital Filter Structures: Block diagram representation: basic building blocks, analysis of block diagrams, Basic FIR digital filter structures: Direct Form structures, Cascade form structures, polyphase realization, Basic IIR digital filter structures: Direct Form structures, Cascade Realizations, Parallel Realizations, FIR & IIR Cascaded lattice structures References/Text Books: 1. Sanjit K Mitra, "Digital signal processing: A computer base approach", 4th edition, Tata McGraw Hill, 2013 2. John G. Proakis, Dimitris G. Manolakis, "Digital Signal Processing, Principles,						

- Algorithms, and Applications”, 4th edition, Pearson Education / PHI, 2007
3. A.V.Oppenheim and R.W. Schaffer, “Discrete Time Signal Processing”, 3rd edition, Pearson Education/PHI, 2014.
 4. B P Lathi, Roger Green, “Essentials of Digital Signal Processing”, Cambridge University Press, 2014
 5. Andreas Antoniou, “Digital Signal Processing”, TATA McGraw Hill, 2006
 6. A Anand Kumar, “Digital Signal Processing”, 2nd edition, Pearson Education / PHI, 2015
 7. Ashok Ambardar, “Digital Signal Processing: A Modern Introduction”, 1st edition, Cengage Learning, 2007.

Lecture Plan: Unit-I & -II syllabus for MID-I, Unit-III & -IV syllabus for MID-II and Unit-V & -VI syllabus for MID-III examinations.

Video Lectures (Web Links):

1. <https://ocw.mit.edu/resources/res-6-008-digital-signal-processing-spring-2011/index.htm>
2. <http://nptel.ac.in/courses/117102060/>
3. <http://nptel.ac.in/courses/117102060/>
4. <http://nptel.ac.in/courses/117104070/>

Study Materials (Web Links):

- 1.
- 2.

Problems & Solutions (Web Links):

- 1.
- 2.

Assignments (Web Links):

- 1.
- 2.