



Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India

(Autonomous Institute Affiliated to University of Mumbai)

| Course Code | Course Name | Teaching Scheme (Hrs/week) | | | Credits Assigned | | | |
|-------------|---------------------------|----------------------------|----|---------------------|------------------|-----|----|-------|
| | | L | T | P | L | T | P | Total |
| CPC701 | Digital Signal Processing | 4 | - | -- | 4 | - | -- | 4 |
| | | Examination Scheme | | | | | | |
| | | ISE | | MSE | | ESE | | |
| | | 10 | 30 | 100 (60% Weightage) | | | | |

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|---|---|
| Pre-requisite Course Codes | - |
| At end of successful completion of this course, student will be able to | |
| Course Outcomes | CO1 Understand the concept of DT Signal and perform signal manipulation |
| | CO2 Perform analysis of DT system in time domain |
| | CO3 Develop FFT flow-graph and Fast DSP Algorithms. |
| | CO4 Design DSP System for Real Time Signal Processing |

| Module No. | Topics | Ref. | Hrs. |
|------------|---|-------------|------|
| 1 | Discrete Time Signal Introduction to Digital Signal Processing, Discrete Time Signals, Sampling and Reconstruction, Standard DT Signals, Concept of Digital Frequency, Representation of DT signal using Standard DT Signals, Signal Manipulations (shifting, addition, subtraction, multiplication), Classification of Signals, Linear Convolution formulation (without mathematical proof), Circular Convolution formulation (without mathematical proof), Matrix Representation of Circular Convolution, Linear by Circular Convolution. Auto and Cross Correlation formula evaluation | 1,3, 4,8 | 12 |
| 2 | Discrete Time System Introduction to Discrete Time System, Classification of DT Systems (Linear/Non Linear, Causal/Non Causal, Time Invariant/Time Variant Systems, Stable/ Unstable), BIBO Time Domain Stability Criteria. LTI system, Concept of Impulse Response and Step Response, Concept of IIR System and FIR System, Output of IIR and FIR DT system using Time Domain Linear Convolution formula Method. | 1,2, 3,4, 7 | 08 |
| 3 | Discrete Fourier Transform Introduction to DTFT, DFT, Relation between DFT and DTFT, Properties of DFT without mathematical proof (Scaling and Linearity, Periodicity, Time Shift and Frequency Shift, Time Reversal, Convolution Property and Parseval's Energy Theorem). DFT computation using DFT properties, Transfer function of DT System in frequency domain using DFT. Linear and Circular Convolution using DFT. Response of FIR system calculation in frequency domain using DFT. | 1,3, 8 | 08 |



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|--------------|---|-------------|-----------|
| 4 | Fast Fourier Transform Radix-2 DIT-FFT algorithm, DIT-FFT Flowgraph for N=4, 6 & 8, InverseFFT algorithm. Spectral Analysis using FFT, Comparison of complex and real, multiplication and additions of DFT and FFT. | 1,3, 8 | 06 |
| 5 | DSP Algorithms Carls' Correlation Coefficient Algorithm, Fast Circular Convolution Algorithm, Fast Linear Convolution Algorithm, Linear FIR filtering using Fast Overlap Add Algorithm and Fast Overlap Save Algorithm. | 1,3, 8,9 | 08 |
| 6 | DSP Processors and Application of DSP Need for Special architecture of DSP processor, Difference between DSP processor & microprocessor, A general DSP processor TMS320C54XX series, Case study of Real Time DSP applications to Speech Signal Processing and Biomedical Signal Processing. | 5,8 | 06 |
| Total | | | 48 |

References:

- [1] Ashok Ambardar, 'Digital Signal Processing', Cengage Learning, 2007, ISBN : 978-81-315-0179-5.
- [2] Emmanuel C. Ifeachor, Barrie W. Jervis, "Digital Signal Processing: A Practical Approach", Pearson Education ISBN 0-201-59619- 9
- [3] S. Salivahanan, A. Vallavaraj, C. Gnanapriya, 'Digital Signal Processing' TataMcgraw Hill Publication First edition (2010). ISBN 978-0-07-066924-6.
- [4] Avtar Singh, S.Srinivasan,"Digital Signal Processing", Thomson Brooks/Cole, ISBN : 981-243-254-4
- [5] B. Venkatramani, M. Bhaskar , "Digital Signal Processor", TataMcGraw Hill, Second Edition, (2001). ISBN : 978-0-07-070256-1.
- [6] SanjitMitra, 'Digital Signal Processing : A Computer Based Approach' , TataMcGraw Hill, Third Edition
- [7] Dr, ShailaApte, "Digital Signal Processing,", Wiley India, Second Edition,2013ISBN : 978-81-2652142-5
- [8] ProakisManolakis, 'Digital Signal Processing : Principles, Algorithms and Applications' Fourth 2007, Pearson Education, ISBN 81-317-1000-9.
- [9] Monson H. Hayes, "Schaums Outline of Digital Signal Processing" McGraw Hill Internationalsecond edition. ISBN : 978-00-7163509-7