



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
EXC 605	Digital Signal Processing and Processors	4	--	--	4	--	--	4
		Examination Scheme						
		ISE		MSE		ESE		
		10	30	100 (60% Weightage)				

Pre-requisite Course Codes	
After successful completion of the course, student will be able to	
Course Outcomes	CO1 Apply DFT Properties and Illustrate FFT algorithms
	CO2 Design and Realize Digital IIR & FIR Filters
	CO3 Analyze the effect of hardware limitations
	CO4 Justify the need and use of DSP processor

Module No.	Unit No.	Topics	Ref.	Hrs.
1		Discrete Fourier Transform and Fast Fourier Transform		10
	1.1	Discrete Fourier Series: Properties of discrete Fourier series, DFS representation of periodic sequences.	1,2,7	
	1.2	Discrete Fourier transforms: Properties of DFT, linear convolution of sequences using DFT, computation of DFT, relation between Z-transform and DFS	1,2,7	
	1.3	Fast Fourier Transforms: Fast Fourier transforms (FFT), Radix-2 decimation in time and decimation in frequency FFT algorithms, inverse FFT, and composite FFT	1,2,7	
2		IIR Digital Filters		10
	2.1	Mapping of S-plane to Z-plane, impulse invariance method, bilinear Z transformation (BLT) method, frequency warping, pre-warping	1,3,7	
	2.2	Analog filter approximations: Butter worth and Chebyshev, design of IIR digital filters from analog filters, design examples	3,7	
	2.3	Analog and digital frequency transformations		
3		FIR Digital Filters		10
	3.1	Characteristics of FIR digital filters, frequency response, location of the zeros of linear phase FIR filters	1,3,7	
	3.2	Design of FIR digital filters using window techniques, Gibbs phenomenon, frequency sampling technique, comparison of IIR and FIR filters	1,3,7	
4		Finite Word Length Effects in Digital Filters		08
	4.1	Number representation, fixed point, sign-magnitude, one's complement, two's complement forms, floating point numbers	3,4	
	4.2	Quantization, truncation, rounding, effects due to truncation and rounding, Input quantization error, Product quantization error, co-	3,4	



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		efficient quantization error, zero-input limit cycle oscillations, overflow limit cycle oscillations, scaling		
	4.3	Quantization in Floating Point realization IIR digital filters, finite word length effects in FIR digital filters, quantization effects in the computation of the DFT- quantization errors in FFT algorithms		
5		Introduction to DSP Processors		08
	5.1	Introduction to fixed point and floating point DSP processor, multiplier and multiplier accumulator (MAC), modified bus structures and memory access schemes in DSPs, multiple access memory, multiport memory, VLIW architecture, pipelining, special addressing modes, on-chip peripherals	4	
	5.2	Features of TMS 320c67xx DSP processor, architecture of TMS 320c67xx DSP processor, architecture features: computational units, bus architecture memory, data addressing, address generation unit, program control, program sequencer, pipelining, interrupts, features of external interfacing, on-chip peripherals, hardware timers, host interface port, clock generators, SPORT	4	
6		Applications of DSP Processors		06
	6.1	Speech Processing: Speech analysis, speech coding, sub band coding, channel vocoder, homomorphic vocoder, digital processing of audio signals.	5	
	6.2	Radar signal processing: Radar principles, radar system and parameter considerations, signal design	5	
			Total	52

References:

- [1] Proakis J., Manolakis D., "Digital Signal Processing", Pearson Education, Fourth Edition
- [2] Oppenheim A., Schafer R., Buck J., "Discrete Time Signal Processing", Pearson Education, Second Edition.
- [3] Babu R., "Digital Signal Processing", Scitech Publications, Fourth Edition
- [4] B. Venkata Ramani and M. Bhaskar, "Digital Signal Processors, Architecture, Programming and Applications", Tata McGraw Hill, Edition 2004.
- [5] L. R. Rabiner and B. Gold, "Theory and Applications of Digital Signal Processing", Prentice-Hall of India, Edition 2006.
- [6] B. Kumar, "Digital Signal Processing", New Age International Publishers, Edition 2014.
- [7] S.Salivahanan, A Vallavaraj, C Gnanapriya, "Digital Signal Processing", Tata McGraw Hill Edition Private Limited, New Delhi, Edition 2010