19EC3502 - Digital Signal Processing

Course Code	19EC3502	Year	III	Semester	I
Course Category	Program Core	Branch	ECE	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Signals and Systems
Continuous Internal Evaluation:	30	Semester End Evaluation:	70	Total Marks:	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	Interpret discrete-time signals and systems using Z-transform, DFT & FFT (L2).
CO2	Build IIR systems in Direct, Cascade and Parallel form structures (L3).
CO3	Apply FFT algorithms for various signal processing operations (L3).
CO4	Analyse frequency response and impulse response of discrete-time LTI systems (L4).
CO5	Design IIR and FIR digital filters for the given specifications (L5).

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)

Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation

* - Average value indicates course correlation strength with mapped PO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	3							2	1	2
CO2	2	3	3	3	2							3	2	1
CO3	3	2	2	2	2							3	2	1
CO4	2	3	3	3	2							2	1	2
CO5	3	2	3	2	3							2	2	2
Average* (Rounded to nearest integer)	3	3	3	2	2							2	2	2

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	**Transform Analysis of Discrete time LTI Systems**: Frequency response of LTI systems, System functions of LTI systems characterized by linear constant coefficient difference equations: Stability, Causality, Impulse response for rational system functions, Structures for IIR Discrete-Time Systems: Direct, Cascade and Parallel forms.	**CO1, CO2, CO4**
II	**The Discrete Fourier Transform (DFT)**: Introduction to Discrete Fourier Transform, Computation of DFT, Properties of	

	DFT, Circular convolution, Linear convolution using DFT, Overlap-add method, Overlap-save method.	**CO1, CO4**
III	**Fast Fourier Transform (FFT)**: Introduction, Radix-2 Decimation-in-time FFT algorithm, Radix-2 Decimation-in-frequency FFT algorithm, Inverse DFT using FFT algorithms.	**CO1, CO3**
IV	**Design of IIR Digital Filters**: Design of analog prototypes from digital filter specifications using Butterworth and Chebyshev approximations, Design of IIR filters from analog filters: Butterworth filter and Chebyshev filter design using Impulse Invariance Method, Bilinear Transformation Method.	**CO1, CO4, CO5**
V	**Design of FIR Digital Filters**: Linear discrete time systems with generalized linear phase, Design of linear phase FIR filters using Window functions (Rectangular, Hamming, Hanning, Blackman and Kaiser), Frequency Sampling technique.	**CO1, CO4, CO5**

Learning Resources
Text Books
1. J. G. Proakis and D. G. Manolakis, Digital Signal Processing: Principles, Algorithms and Applications, 4/e, Pearson Education, 2007. 2. Fundamentals of Digital Signal Processing - Lonnie C Ludeman, John Wiley & Sons, 2003
Reference Books
1 A.V. Oppenheim, R. W. Schafer, Discrete-Time Signal Processing, 3/e, Prentice Hall of India, 2009. 2. Digital Signal Processing "A – Computer Based Approach" - Sanjit K Mitra, Tata Mc Graw Hill 2nd Edition, 2003
e- Resources & other digital material
1. http://www.nptel.iitm.ac.in/ 2. http://www.ee.umanitoba.ca/~moussavi/dsp815/LectureNotes/index.html 3. http://www.ece.cmu.edu/~ee791 4. http://cobweb.ecn.purdue.edu/~ipollak/ee438/FALL04/notes/notes.html

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