DIGITAL SIGNAL PROCESSING

Course Code	20EC3601	**Year**	III	**Semester**	II
Course Category	Program Core	**Branch**	ECE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Signals & 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 (L2).
CO2	Analyse frequency response and impulse response of discrete-time LTI systems (L4).
CO3	Build Digital Systems in Direct, Cascade and Parallel form structures (L3).
CO4	Design IIR and FIR digital filters for the given specifications (L5).
CO5	Apply FFT & Multirate signal processing concepts to various DSP applications (L3).

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	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3								3	2		1	2	1
CO2		3							3	2		1	2	1
CO3	3								2	3		1	2	1
CO4			3						2	2		1	2	1
CO5	3								2	3		1	2	1
Average* (Rounded to nearest integer)	3	3	3						2	2		1	2	1

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	**Transform Analysis of Discrete time LTI Systems**: Analysis of Discrete-time Linear Time-Invariant Systems, Convolution, Stability, Causality, Frequency response of LTI systems, System functions of LTI systems characterized by linear constant coefficient difference equations: Stability, Causality, Impulse response and Step response for rational system functions.	CO1, CO2
II	**The Discrete Fourier Transform (DFT)**: Introduction to Discrete Fourier Transform, Computation of DFT, Properties of DFT, Circular convolution, Linear convolution using DFT, Introduction, Radix-2 Decimation-in-time FFT algorithm, Radix-2 Decimation-in-frequency FFT algorithm, Inverse DFT using FFT algorithms.	CO1, CO5
III	**Design of IIR Digital Filters**: Design of analog prototypes from digital filter specifications using Butterworth and Chebyshev	CO1, CO2, CO4

	approximations, Design of IIR filters from analog filters: Butterworth filter and Chebyshev filter design using Impulse Invariance Method, Bilinear Transformation Method.	
IV	**Design of FIR Digital Filters**: Linear discrete time systems with generalized linear phase, Design of linear phase FIR filters using Window functions, Frequency Sampling technique. **Realization of Discrete time systems:** Realization of IIR and FIR systems-Direct, Cascade & Parallel realizations.	CO1- CO4
V	**Multirate Digital Signal Processing:** Introduction, Decimation and Interpolation by integer factor, Sampling rate conversion by Rational number, Multistage approach to sampling rate Conversion, Applications of Multirate Signal processing.	CO1, CO5

Learning Resources
Text Books
1. J. G. Proakis and D. G. Manolakis, Digital Signal Processing: Principles, Algorithms and Applications, 4th Ed., Pearson Education, 2007. 2. Lonnie C Ludeman - Fundamentals of Digital Signal Processing-John Wiley & Sons, 2003
Reference Books
1 A.V. Oppenheim, R. W. Schafer, Discrete-Time Signal Processing, 3rd Ed., Prentice Hall of India,2009. 2. Sanjit K Mitra - Digital Signal Processing "A – Computer Based Approach" - Tata Mc Graw Hill 2nd Ed, 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

---