ADVANCED DIGITAL SIGNAL PROCESSING

PE-II: EPS

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BPSC09	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

Prerequisite: Signalsand Systems, Digital Signal Processing

I. COURSEOVERVIEW:

The course provides a good understanding of DSP principles, and their implementation and equips students to put the ideas into practice and/or to tackle more advanced aspects of DSP.This course will provide a comprehensive grounding in DSP concepts and algorithms, plus practical information on the design and implementation of DSP systems

II. COURSE OBJECTIVES:

The students will try tolearn:

I. The background and fundamental material for the analysis and processing of digital signals.
II. The fast computation of DFT and appreciate the FFT processing.
III. The designs and structures of digital (IIR and FIR) filters and analyze and synthesize for a given specifications.

III.COURSE OUTCOMES:

CO1	**Demonstrate** an understanding of the building blocks of basic and modern control systems by creating mathematical models of physical systems in input-output or transfer function form;	Understand
CO2	**Organize** state representations to satisfy design requirements using transformations and decompositions	Apply
CO3	**Understand** theory of prediction and solution of normal equations	Understand
CO 4	**Assess** a system for its stability, controllability, and observability properties leading to design of controller and observer in a feedback control system	Apply
CO 5	**Aspire** for pursuing a carrier in control, recognize the need to learn, to engage and to adapt in a world of constantly changing technology and play role of team leader or supporter of team.	Understand

IV. COURSESYLLABUS:

MODULE-I: INTRODUCTION (9)

Discrete time systems, types of signals and their characteristics, types of systems and their behavior. analysis of discrete time linear invariant systems, convolution and correlation of discrete time systems ,z transforms and inverse z transform, Properties of z transform, ROC and its properties

MODULE-II: DISCRETE-TIME FOURIER TRANSFORM AND FAST FOURIER TRANSFORMS (9)

Discrete-time Fourier transform: Definition of Fourier transform (FT), important properties of FT, , The Discrete Fourier transforms, its properties and applications. Frequency domain sampling, properties of DFT, Computation of DFT: Over-Lap Add Method, Over-Lap Save Method, Relation between DTFT, DFS, DFT and Z- Transform. Fast Fourier Transforms: Fast Fourier Transforms (FFT) - Radix-2 Decimation-in-Time and Decimation-in-Frequency FFT Algorithms, Inverse FFT

MODULE-III:DIGITAL FILTER DESIGN (10)

IIR Filter: Designs based on analog filter approximation impulse invariant, Bilinear transformation, Time domain design techniques. Buttorworth, Chebyshev type I & II,

Properties and design of FIR filters: Properties, Design techniques - window technique, Frequency sampling comparison of IIR and FIR filters.

MODULE-IV: POWER SPECTRUM ANALYSIS (8)

Power spectrum estimation, Non-parametric and parametric methods for power spectrum estimation. Period gram method, Blackman – Turkey method, fast correlation method. Autoregressive spectrum estimation.

MODULE-V: WAVELET TRANSFORMS (9)

Wavelet Transforms: Short Time Fourier Transform, introduction of Continuous Wavelet Transform, Discretization of the Continuous Wavelet Transform (DWT). Introduction to discrete and fast wavelet transforms.

IV. TEXT BOOKS

1. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009
2. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.
3. S.K. Mitra, Digital Signal Processing, A Computer-Based Approach, Tata Mc GrawHill, 1998

V. REFERENCE BOOKS:

1. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008
2. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L. Harris, Thomson, 2007
3. Digital Signal Processing – S. Salivahanan, A. Vallavaraj and C. Gnanapriya, TMH, 2009
4. Digital Signal Processing - A Practical approach, Emmanuel C. Ifeachor and Barrie W. Jervis, 2nd Edition, Pearson Education, 2009

VI. WEB REFERENCES:

1. https://www.researchgate.net
2. https://www.electrical4u.com
3. https://web.iitd.ac.in/~sumeet/WaveletTutorial.pdf
4. http://www-syscom.univ-mlv.fr/~zaidi/teaching/dsp-esipe-oc2/Course-Notes__Advanced-DSP.pdf

VII. E-TEXT BOOKS:

1. https://www.jntubook.com/
2. https://www.itseyeris.com/book/digital-signal-processing-a-practical-guide-for-engineers-and-scientists