filter for signals with known second order statistics.
CO 4: A comprehensive understanding of formulation of the Wiener filter as a constrained optimization problem.
CO 5: A comprehensive study and analysis of Lattice structures of FIR (AZ), and IIR (AP and PZ Lattice-Ladder) systems and their advantages.
CO 6: A comprehensive understanding of the quantization of numbers represented in fixed-point and floating-point format.
CO 7: A comprehensive understanding of the concept of finite word length effects in signal processing systems, e.g., DFT computation, FIR and IIR system structures, zero-input limit cycle.
CO 8: A basic understanding of two-dimensional signal processing and its application in image processing.

COURSE CONTENT:

Multirate signal processing: decimation and interpolation, Polyphase decomposition, QMF, Optimum linear filters, Lattice structures, Forward and backward linear prediction, The Levinson-Durbin algorithm, Power Spectrum Estimation: Nonparametric methods, Parametric methods, Eigenanalysis algorithms for spectrum estimation: PHD, Eigen-decomposition, MUSIC, ESPRIT algorithms.

SUGGESTED READINGS:

1. S.K. Mitra, ``Digital Signal Processing, A Computer Based approach,'' Tata Mc Graw Hill.
2. P.P. Vaidyanathan, Multirate, `` Systems & Filter Banks,'' Prentice Hall
3. Tarun Kumar Rawat, ``Digital Signal Processing,'' Oxford University Press

Course No.	Title of the Course	Course Structure	Pre-Requisite
ECD 14	Digital System design using VHDL/Verilog	3L-0T-2P	ECC03

COURSE OUTCOMES (CO):

CO-1: Foster ability to identify and code the module using different modeling styles.
CO-2: Foster ability to write test benches in VHDL.
CO-3: Acquired knowledge about FSM and how to code a FSM.
CO-4: Ability to develop synthesizable code in VHDL.

COURSE CONTENT:

Introduction to VHDL, design units, data objects, signal drivers, inertial and transport delays, delta delay, VHDL data types, concurrent and sequential statements. Subprograms – Functions, Procedures, attributes, generio, generate, package, IEEE standard logic library, file I/O, test bench, component declaration, instantiation, configuration. Combinational logic circuit design and VHDL implementation of following circuits – first adder, Subtractor, decoder, encoder, multiplexer, ALU, barrel shifter, 4X4 key board encoder, multiplier, divider, Hamming code encoder and correction circuits. Synchronous sequential circuits design – finite state machines, Mealy and Moore, state assignments, design and VHDL implementation of FSMs, Linear feedback shift register (Pseudorandom and CRC) Asynchronous sequential circuit design – primitive flow table, concept of race, critical race and hazards, design issues like metastability, synchronizers, clock skew and timing considerations. Introduction to place & route process, Introduction to ROM, PLA, PAL,

SCHEME OF COURSES - B.E. Electronics and Communication Engineering

Architecture of CPLD (Xilinx / Altera).
SUGGESTED READINGS: 1. Douglas Perry, `` VHDL,'' Tata McGraw Hill 2. Stephen Brown, ZvonkoVranesic, ``Fundamentals of Digital Logic with VHDL design,'' Tata McGraw Hill 3. Fletcher, ``An engineering approach to Digital Design Principles,'' Prentice Hall 4. J Bhasker, `` VHDL Synthesis,'' Pearson Education 5. J Bhasker, `` VHDL Primer,'' Pearson Education. 4. Chales H. Roth, ``Digital System Design Using VHDL,'' PWS Publishing Company 5. John Wakerley, `` Digital System Design,'' Pearson 6. Zainalabedin Navabbi, ``VHDL ,'' McGraw Hill

Course No.	Title of the Course	Course Structure	Pre-Requisite
ECD 15	Video Processing	3L-1T-0P	ECC15
COURSE OUTCOMES (CO): *CO-1:* A comprehensive understanding of basics of digital video processing. CO-2: A comprehensive understanding of motion estimation methods. CO-3: Understanding of depth perception and stereo imaging principle. *CO-4:* A comprehensive understanding of video coding and its international standards. *CO-5:* A comprehensive understanding of video compression techniques.			
COURSE CONTENT: Representation of digital video: Introduction and fundamentals, Time-varying image formation models: Motion models, Geometric image formation. Spatio-temporal sampling: Sampling of analog and digital video, Two-dimensional rectangular and periodic sampling, Sampling of 3-D structures, Reconstruction from samples, Sampling structure conversion: Sampling rate change, Sampling lattice conversion , Two-Dimensional Motion Estimation: Optical flow based methods, Block-based methods, Pel-recursive methods, Bayesian methods based on Gibbs Random Fields., Image Compression: Lossless compression, DPCM, Transform coding, JPEG, Vector Quantization, Subband Coding, Video compression: Interframe compression methods (3-d waveform and motion-compensated waveform coding), Video compression standards (H.261, MPEG-1, MPEG-2).			
SUGGESTED READINGS: 1. John W. Woods, ``Multidimensional Signal, Image, and Video Processing and Coding,'' Academic Press 2. M. Tekalp, ``Digital Video Processing,'' Prentice Hall 3. Alan C. Bovik, ``The Essential Guide to Video Processing','' Elsevier Science.			

Course No.	Title of the Course	Course Structure	Pre-Requisite
ECD 16	Radar Signal Processing	3L-1T-0P	ECC15