ACADEMIC REGULATIONS & COURSE STRUCTURE

For

C&C, C&CE

(Applicable for batches admitted from 2016-2017)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India
## I Semester

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<th>S. No.</th>
<th>Subject</th>
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<tr>
<td>1</td>
<td>Digital System Design</td>
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<td>Advanced Computer Architecture</td>
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<td>Wireless Communications and Networks</td>
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<td>Digital Data Communications</td>
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<td>I. Data Base Management Systems</td>
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<td>II. Information Theory and Coding Techniques</td>
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<td>III. Big Data Analytics</td>
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<td>I. Internet Protocols</td>
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<td>II. Image &amp; Video Processing</td>
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<td>III. Objective Oriented Programming</td>
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<td>System Design &amp; Data Communications Lab</td>
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## II Semester

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<td>II. Internet of Things</td>
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<td>III. Soft Computing Techniques</td>
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<td>IV. Cyber Security</td>
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<td>III. Network Security &amp; Cryptography</td>
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### IV Semester

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</table>
UNIT-I: Minimization Procedures and CAMP Algorithm:

Review on minimization of switching functions using tabular methods, k-map, QM algorithm, CAMP-I algorithm, Phase-I: Determination of Adjacencies, DA, CSC, SSMs and EPCs,, CAMP-I algorithm, Phase-II: Passport checking, Determination of SPC, CAMP-II algorithm: Determination of solution cube, Cube based operations, determination of selected cubes are wholly within the given switching function or not, Introduction to cube based algorithms.

UNIT-II: PLA Design, Minimization and Folding Algorithms:

Introduction to PLDs, basic configurations and advantages of PLDs, PLA-Introduction, Block diagram of PLA, size of PLA, PLA design aspects, PLA minimization algorithm (IISc algorithm), PLA folding algorithm (COMPACT algorithm)-Illustration of algorithms with suitable examples.

UNIT-III: Design of Large Scale Digital Systems:

Algorithmic state machine charts-Introduction, Derivation of SM Charts, Realization of SM Chart, control implementation, control unit design, data processor design, ROM design, PAL design aspects, digital system design approaches using CPLDs, FPGAs and ASICs.

UNIT-IV: Fault Diagnosis in Combinational Circuits:

Faults classes and models, fault diagnosis and testing, fault detection test, test generation, testing process, obtaining a minimal complete test set, circuit under test methods- Path sensitization method, Boolean difference method, properties of Boolean differences, Kohavi algorithm, faults in PLAs, DFT schemes, built in self-test.

UNIT-V: Fault Diagnosis in Sequential Circuits:

Fault detection and location in sequential circuits, circuit test approach, initial state identification, Haming experiments, synchronizing experiments, machine identification, distinguishing experiment, adaptive distinguishing experiments.

TEXT BOOKS:

1. Logic Design Theory-N. N. Biswas, PHI
3. Digital system Design using PLDd-Lala

REFERENCE BOOKS:

UNIT -I: Fundamentals of Computer Design:
Fundamentals of Computer design, Changing faces of computing and task of computer designer, Technology trends, Cost price and their trends, measuring and reporting performance, quantitative principles of computer design, Amdahl’s law.
Instruction set principles and examples- Introduction, classifying instruction set- memory addressing- type and size of operands, operations in the instruction set.

UNIT –II: Pipelines:
Introduction ,basic RISC instruction set ,Simple implementation of RISC instruction set, Classic five stage pipe line for RISC processor, Basic performance issues in pipelining , Pipeline hazards, Reducing pipeline branch penalties.

Memory Hierarchy Design:

UNIT -III: Instruction Level Parallelism - The Hardware Approach:
Instruction-Level parallelism, Dynamic scheduling, Dynamic scheduling using Tomasulo’s approach, Branch prediction, high performance instruction delivery- hardware based speculation.

ILP Software Approach:
Basic compiler level techniques, static branch prediction, VLIW approach, Exploiting ILP, Parallelism at compile time, Cross cutting issues - Hardware verses Software.

UNIT –IV: Multi Processors and Thread Level Parallelism:
Multi Processors and Thread level Parallelism- Introduction, Characteristics of application domain, Systematic shared memory architecture, Distributed shared – memory architecture, Synchronization.
UNIT – V:
Inter Connection and Networks:
Introduction, Interconnection network media, Practical issues in interconnecting networks, Examples of inter connection, Cluster, Designing of clusters.

Intel Architecture:
Intel IA- 64 ILP in embedded and mobile markets Fallacies and pit falls

TEXT BOOKS:

REFERENCE BOOKS:
UNIT -I:
The Cellular Concept-System Design Fundamentals:
Introduction, Frequency Reuse, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference, Power Control for Reducing interference, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Trunking and Grade of Service

UNIT –II:
Mobile Radio Propagation: Large-Scale Path Loss:

UNIT –III:
Mobile Radio Propagation: Small –Scale Fading and Multipath
Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke’s model for flat fading, spectral shape due to Doppler spread in Clarke’s model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model. 
UNIT -IV:  
**Equalization and Diversity**  

UNIT -V:  
**Wireless Networks**  
Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, HiperLan, WLL.

**TEXT BOOKS:**  

**REFERENCE BOOKS:**  
2. Wireless Digital Communications – KamiloFeher, 1999, PHI.  
DIGITAL DATA COMMUNICATIONS

UNIT -I:
Digital Modulation Schemes:
BPSK, QPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK – Methods, Band Width Efficiency, Carrier Recovery, Clock Recovery.

UNIT -II:
Basic Concepts of Data Communications, Interfaces and Modems:

UNIT -III:
Error Correction: Types of Errors, Vertical Redundancy Check (VRC), LRC, CRC, Checksum, Error Correction using Hamming code
Data Link Control: Line Discipline, Flow Control, Error Control

UNIT -IV:
Multiplexing: Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Multiplexing Application, DSL.
Local Area Networks: Ethernet, Other Ether Networks, Token Bus, Token Ring, FDDI.
Metropolitan Area Networks: IEEE 802.6, SMDS
Switching: Circuit Switching, Packet Switching, Message Switching.
Networking and Interfacing Devices: Repeaters, Bridges, Routers, Gateway, Other Devices.

UNIT -V:
Multiple Access Techniques:
Frequency- Division Multiple Access (FDMA), Time - Division Multiple Access (TDMA), Code - Division Multiple Access (CDMA), OFDM and OFDMA. Random Access, Aloha- Carrier Sense Multiple Access (CSMA)- Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA), Controlled Access- Reservation- Polling- Token Passing, Channelization.
TEXT BOOKS:

REFERENCE BOOKS:
1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
UNIT -I:
Introduction-Database System Applications:
Introduction to Database design, ER diagrams, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises. Relational Model:
Introduction to the Relational Model – Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical database Design, Introduction to Views – Destroying /altering Tables and Views.

UNIT –II:
Relational Algebra and Calculus:


Form of Basic SQL Query – Examples of Basic SQL Queries, Introduction to Nested Queries, Correlated Nested Queries, Set – Comparison Operators, Aggregate Operators, NULL values – Comparison using Null values – Logical connectives – AND, OR and NOT – Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Data bases.

UNIT -III:
Introduction to Schema Refinement:

UNIT –IV:
Transaction Management-Transaction Concept:


Concurrency Control- Lock –Based Protocols – Timestamp Based Protocols- Validation- Based Protocols – Multiple Granularity.


UNIT -V:
Overview of Storage and Indexing:

Data on External Storage, File Organization and Indexing – Clustered Indexes, Primary and Secondary Indexes, Index data Structures – Hash Based Indexing, Tree based Indexing, Comparison of File Organizations.


Hash Based Indexing: Static Hashing, Extendable hashing, Linear Hashing, Extendible vs. Linear Hashing.

TEXT BOOKS:

REFERENCE BOOKS:
9. Introduction to Database Systems - C.J.Date, Pearson Education.
10. Database Management Systems - G.K.Gupta, TMH.
INFORMATION THEORY AND CODING TECHNIQUES

(ELECTIVE- I)

UNIT I
INFORMATION THEORY AND SOURCE CODING
Uncertainty, information, entropy and its properties, entropy of binary memoryless source and its extension to discrete memoryless source, source coding theorem, data compression, prefix coding, Huffman coding, Lempel-Ziv coding, Source with memory and its entropy.

UNIT II
DISCRETE CHANNELS
Binary Symmetric Channel, mutual information & its properties, Channel capacity, channel coding theorem and its application to BSC, Shannon’s theorem on channel capacity, capacity of a channel of infinite bandwidth, bandwidth - S/N trade off, practical communication systems in light of Shannon’s theorem, Fading channel, channels with memory.

UNIT III
GROUPS, FIELDS AND LINEAR BLOCK CODES
Galois field and its construction in GF($2^n$) and its basic properties, vector spaces and matrices in GF(2), Linear block codes, systematic codes and its encoding circuit, syndrome and error detection, minimum distance, error detecting and correcting capabilities of block code, decoding circuit, probability of undetected error for linear block code in BSC, Hamming code and their applications.

UNIT IV
CYCLIC CODES AND BCH CODES
Basic properties of Cyclic codes, Generator and parity check matrix of cyclic codes, encoding and decoding circuits, syndrome computation and error detection, cyclic Hamming codes, encoding and decoding of BCH codes, error location and correction.

UNIT V
CONVOLUTIONAL CODES
Introduction to convolution code, its construction and Viterbi algorithm for maximum likelihood decoding, Automatic repeat request strategies and their throughput efficiency considerations.

Reference Books

6. Schaum’s Outline Series, Analog and Digital Communication, TMH.
I Year I Semester

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BIG DATA ANALYTICS
UNIT -I:
Internetworking Concepts:

IP Address:
Classful Addressing: Introduction, Classful Addressing, Other Issues, Sub-netting and Super-netting
ARP and RARP: ARP, ARP Package, RARP.

UNIT -II:
Mobile IP: Addressing, Agents, Three Phases, Inefficiency in Mobile IP.

UNIT -III:
Unicast Routing Protocols (RIP, OSPF, and BGP): Intra and Inter-domain Routing, Distance Vector Routing, RIP, Link State Routing, OSPF, Path Vector Routing, BGP.
Multicasting and Multicast Routing Protocols: Unicast - Multicast- Broadcast, Multicast Applications, Multicast Routing, Multicast Link State Routing: MOSPF, Multicast Distance Vector: DVMRP.

UNIT -IV:
Domain Name System (DNS): Name Space, Domain Name Space, Distribution of Name Space, and DNS in the internet.
Remote Login TELNET: Concept, Network Virtual Terminal (NVT).
Electronic Mail: SMTP and POP.
UNIT -V:
Multimedia:

TEXT BOOKS:
2. Internetworking with TCP/IP Comer 3 rd edition PHI

REFERENCE BOOKS:
UNIT –I:  
**Fundamentals of Image Processing and Image Transforms:**  
Introduction, Image sampling, Quantization, Resolution, Image file formats, Elements of image processing system, Applications of Digital image processing.  
Introduction, Need for transform, image transforms, Fourier transform, 2 D Discrete Fourier transform and its transforms, Importance of phase, Walsh transform, Hadamard transform, Haar transform, slant transform, Discrete cosine transform, KL transform, singular value decomposition, Radon transform, comparison of different image transforms.

UNIT –II:  
**Image Enhancement:**  
Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters.  
Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.  
**Image Restoration:**  
Introduction to Image restoration, Image degradation, Types of image blur, Classification of image restoration techniques, Image restoration model, Linear and Nonlinear image restoration techniques, Blind deconvolution.

UNIT –III:  
**Image Segmentation:**  
Introduction to image segmentation, Point, Line and Edge Detection, Region based segmentation., Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding, Edge based segmentation, Edge detection and linking, Hough transform, Active contour.  
**Image Compression:**  

UNIT -IV:  
**Basic Steps of Video Processing:**  
UNIT –V:

2-D Motion Estimation:
Optical flow, General Methodologies, Pixel Based Motion Estimation, Block-Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.

TEXT BOOKS:

REFERENCE BOOKS:
OBJECT ORIENTED PROGRAMMING
(ELECTIVE II)

Objective: Implementing programs for user interface and application development using core java principles

UNIT I:
Objective: Focus on object oriented concepts and java program structure and its installation

Introduction to OOP
Introduction, Need of Object Oriented Programming, Principles of Object Oriented Languages, Procedural languages Vs OOP, Applications of OOP, History of JAVA, Java Virtual Machine, Java Features, Installation of JDK1.6

UNIT II:
Objective: Comprehension of java programming constructs, control structures in Java

Programming Constructs
Variables , Primitive Datatypes, Identifiers- Naming Conventions, Keywords, Literals, Operators- Binary, Unary and ternary, Expressions, Precedence rules and Associativity, Primitive Type Conversion and Casting, Flow of control- Branching, Conditional, loops.

Classes and Objects- classes, Objects, Creating Objects, Methods, constructors- Constructor overloading, Garbage collector, Class variable and Methods- Static keyword, this keyword, Arrays, Command line arguments

UNIT III:
Objective: Implementing Object oriented constructs such as various class hierarchies, interfaces and exception handling

Inheritance: Types of Inheritance, Deriving classes using extends keyword, Method overloading, super keyword, final keyword, Abstract class
Interfaces, Packages and Enumeration: Interface-Extending interface, Interface Vs Abstract classes, Packages- Creating packages , using Packages, Access protection, java.lang package
Exceptions & Assertions - Introduction, Exception handling techniques-try...catch, throw, throws, finally block, user defined exception, Assertions

UNIT IV:
Objective: Understanding of Thread concepts and I/O in Java

MultiThreading : java.lang.Thread, The main Thread, Creation of new threads, Thread priority, Multithreading, Synchronization, suspending and Resuming threads, Communication between Threads
Input/Output: reading and writing data, java.io package
UNIT V: 
*Objective: Being able to build dynamic user interfaces using applets and Event handling in java*

**Applets** - Applet class, Applet structure, An Example Applet Program, Applet Life Cycle, paint(), update() and repaint()

**Event Handling** - Introduction, Event Delegation Model, java.awt.event Description, Event Listeners, Adapter classes, Inner classes

UNIT VI: 
*Objective: Understanding of various components of Java AWT and Swing and writing code snippets using them*

**Abstract Window Toolkit**
Why AWT?, java.awt package, Components and Containers, Button, Label, Checkbox, Radio buttons, List boxes, Choice boxes, Text field and Text area, container classes, Layouts, Menu, Scroll bar

**Swing:**
Introduction, JFrame, JApplet, JPanel, Components in swings, Layout Managers, JList and JScrollPane, Split Pane, JTabbedPane, Dialog Box

**Text Books:**

1. The Complete Reference Java, 8ed, Herbert Schildt, TMH
3. JAVA for Beginners, 4e, Joyce Farrell, Ankit R. Bhavsar, Cengage Learning.
4. Object oriented programming with JAVA, Essentials and Applications, Raj Kumar Bhuyya, Selvi, Chu TMH
5. Introduction to Java rogramming, 7th ed, Y Daniel Liang, Pearson

**Reference Books:**

1. JAVA Programming, K.Rajkumar.Pearson
2. Core JAVA, Black Book, NageswaraRao, Wiley, Dream Tech
3. Core JAVA for Beginners, RashmiKanta Das, Vikas.
A student has to do at least 6 Experiments from each Part.

Part A:

**Systems Design experiments**

- The students are required to design the logic to perform the following experiments using necessary Industry standard simulator to verify the logical /functional operation, perform the analysis with appropriate synthesizer and to verify the implemented logic with different hardware modules/kits (CPLD/FPGA kits).
- Consider the suitable switching function and data to implement the required logic if required.

**List of Experiments:**

1. Determination of EPCs using CAMP-I Algorithm.
2. Determination of SPCs using CAMP-I Algorithm.
3. Determination of SCs using CAMP-II Algorithm.
4. PLA minimization algorithm (IISc algorithm)
5. PLA folding algorithm (COMPACT algorithm)
6. ROM design.
7. Control unit and data processor logic design
8. Digital system design using FPGA.
10. Hamming experiments.

**Lab Requirements:**

**Software:** Industry standard software with perpetual licence consisting of required simulator, synthesizer, analyzer etc. in an appropriate integrated environment.

**Hardware:** Personal Computer with necessary peripherals, configuration and operating System and relevant VLSI (CPLD/FPGA) hardware Kits.
Part-B:

Data Communications Experiments

1. Study of serial interface RS – 232
2. Study of pc to pc communication using parallel port
3. To establish pc-pc communication using LAN
4. Study of LAN using star topology, bus topology and tree topology
5. Study and configure modem of a computer
6. To configure a hub/switch
7. To study the interconnections of cables for data communication
8. Study of a wireless communication system

Software and Equipment required

- Data Communication Trainer kits
- Computers
- LAN Trainer kit
- ST 5001 Software/NS2 Software
- Serial and parallel port cables
- Patch cords (2 mm), FOE/LOE Cables, Main power cords
- Ethernet Cables (CAT5, CAT5E, CAT6, CAT7)
- Hubs, Switches, MODEMs
- RS 232 DB25/DB9 Connectors
ADVANCED OPERATING SYSTEMS

UNIT-I: Introduction to Operating Systems:
Overview of computer system hardware, Instruction execution, I/O function, Interrupts, Memory hierarchy, I/O Communication techniques, Operating system objectives and functions, Evaluation of operating System

UNIT-II: Introduction to UNIX and LINUX:
Basic Commands & Command Arguments, Standard Input, Output, Input / Output Redirection, Filters and Editors, Shells and Operations

UNIT-III:
System Calls:
System calls and related file structures, Input / Output, Process creation & termination.
Inter Process Communication:
Introduction, File and record locking, Client – Server example, Pipes, FIFOs, Streams & Messages, Name Spaces, Systems V IPC, Message queues, Semaphores, Shared Memory, Sockets & TLI.

UNIT-IV:
Introduction to Distributed Systems:
Goals of distributed system, Hardware and software concepts, Design issues.
Communication in Distributed Systems:
Layered protocols, ATM networks, Client - Server model, Remote procedure call and Group communication.

UNIT-V:
Synchronization in Distributed Systems:
Clock synchronization, Mutual exclusion, E-tech algorithms, Bully algorithm, Ring algorithm, Atomic transactions
Deadlocks:
Dead lock in distributed systems, Distributed dead lock prevention and distributed dead lock detection.
TEXT BOOKS:

1. The Design of the UNIX Operating Systems – Maurice J. Bach, 1986, PHI.
2. Distributed Operating System - Andrew. S. Tanenbaum, 1994, PHI.

REFERENCE BOOKS:

UNIT -I:
Congestion and Quality of Service (QoS):
Data traffic, Congestion, Congestion Control, Two examples, Quality of Service, Techniques to improve QOS, Integrated Services and Differential services. Queue Management: Passive-Drop trial, Drop front, Random drop, Active- early Random drop, Random Early detection.

UNIT -II:

UNIT -III:

UNIT -IV:
Next Generation: IPV6 Transition from IPV4 to IPV6, Mobile IP: Addressing, Agents, Three phases, Inefficiency in Mobile IP

UNIT -V:
TEXT BOOKS:
1. Data Communication and Networking - B. A. Forouzan, 4th Ed, TMH

REFERENCE BOOKS:
1. Wireless Communication System- AbhishekYadav, University Sciences Press
2. Wireless Digital Communications – KamiloFeher, 1999, PHI
3. High Performance TCP-IP Networking- Mahaboob Hassan, Jain Raj, PHI
ADVANCED DIGITAL SIGNAL PROCESSING

UNIT –I:
Review of DFT, FFT, IIR Filters and FIR Filters:
Multi Rate Signal Processing: Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion.

UNIT –II:
Applications of Multi Rate Signal Processing:

UNIT –III:
Non-Parametric Methods of Power Spectral Estimation: Estimation of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods

UNIT –IV:
Implementation of Digital Filters:
Introduction to filter structures (IIR & FIR), Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

UNIT –V:
TEXT BOOKS:

REFERENCE BOOKS:
Unit –I

Overview of optical fiber communications: Elements of an optical fiber transmission link.

Optical Fibers: structures, wave guiding, Nature of light, Basic optical laws and definitions, optical fiber modes and configurations (Fiber types, Rays and modes, step index and graded index fibers) mode theory of circular waveguides. (Qualitative Treatment) Fabrication, cabling and installation: Fabrication, fiber optic cables, Installation- placing the cable.

Unit – II

Optical sources: LEDs, structures, quantum efficiency, modulation capability, Laser diodes: Laser diodes and threshold conditions, external quantum efficiency resonant frequencies, Optical Detectors: Physical principles of photodiodes (pin Photodiode, avalanche, photo diode) comparison of photo detectors, noise in detectors.

Unit – III

Optical Communication Systems: Block diagrams of optical communication systems, direct intensity modulation, digital communication systems, Laser semiconductor transmitter, Generations of optical fiber link, description of 8 Mb/s optical fiber communication link, description of 2.5 Gb/s optical fiber communication link.

Unit – IV

Components of fiber optic Networks: Overview of fiber optic networks, Transreceiver, semiconductors optical amplifiers, couplers/splicers, wavelength division multiplexers and demultiplexers, filters, isolators and optical switches.

Fiber Optic Networks: Basic networks, SONET/SDIT, Broad cast and select WDM Networks, wavelength routed networks, optical CDMA Non linear effects on network performance.

Unit – V

Coherent Systems: Coherent receiver, Homodyne and heterodyne detection, noise in coherent receiver, polarization control, Homodyne receiver, Reusability and laser line-width, heterodyne receiver, synchronous, Asynchronous and self synchronous demodulation, phase diversity receivers.
Text Books:
1. Optical fiber communications – Gerd Keiser, 3rd Ed. MGH.
2. Fiber Optic Communication Technology – Djafar K. Mynbaev and Lowell L. Scheiner, (Pearson Education Asia)

References:
1. Fiber Optics Communications – Harold Kolimbiris (Pearson Education Asia)
3. WDM Optical Networks – C. Siva Ram Murthy and Mohan Guru Swamy, PHI.
UNIT -I:

Introduction, Natural and Nuclear Sources of EMI / EMC:

Electromagnetic environment, History, Concepts, Practical experiences and concerns, frequency spectrum conservations, An overview of EMI / EMC, Natural and Nuclear sources of EMI.

UNIT -II:

EMI from Apparatus, Circuits and Open Area Test Sites:

Electromagnetic emissions, Noise from relays and switches, Non-linearities in circuits, passive intermodulation, Cross talk in transmission lines, Transients in power supply lines, Electromagnetic interference (EMI), Open area test sites and measurements.

UNIT -III:

Radiated and Conducted Interference Measurements and ESD:

Anechoic chamber, TEM cell, GH TEM Cell, Characterization of conduction currents / voltages, Conducted EM noise on power lines, Conducted EMI from equipment, Immunity to conducted EMI detectors and measurements, ESD, Electrical fast transients / bursts, Electrical surges.

UNIT -IV:

Grounding, Shielding, Bonding and EMI filters:

Principles and types of grounding, Shielding and bonding, Characterization of filters, Power lines filter design.

UNIT -V:

Cables, Connectors, Components and EMC Standards:

EMI suppression cables, EMC connectors, EMC gaskets, Isolation transformers, optoisolators, National / International EMC standards.
TEXT BOOKS:


REFERENCE BOOKS:

INTERNET OF THINGS
I Year II Semester

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SOFT COMPUTING TECHNIQUES

(ELECTIVE -III)

UNIT –I:

Introduction:

Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, Knowledge representation - Expert systems.

UNIT –II:

Artificial Neural Networks:

Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron, Learning and Training the neural network, Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.

UNIT –III:

Fuzzy Logic System:

Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modeling and control schemes for nonlinear systems, Self-organizing fuzzy logic control, Fuzzy logic control for nonlinear timedelay system.

UNIT –IV:

Genetic Algorithm:

Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search and aND-colony search techniques for solving optimization problems.
UNIT –V:

Applications:


TEXT BOOKS:


REFERENCE BOOKS:

I Year II Semester

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CYBER SECURITY
UNIT-I: Introduction

An Embedded System-Definition, Examples, Current Technologies, Integration in system Design, Embedded system design flow, hardware design concepts, software development, processor in an embedded system and other hardware units, introduction to processor based embedded system design concepts.

UNIT-II: Embedded Hardware

Embedded hardware building blocks, Embedded Processors – ISA architecture models, Internal processor design, processor performance, Board Memory – ROM, RAM, Auxiliary Memory, Memory Management of External Memory, Board Memory and performance.

Embedded board Input / output – Serial versus Parallel I/O, interfacing the I/O components, I/O components and performance, Board buses – Bus arbitration and timing, Integrating the Bus with other board components, Bus performance.

UNIT-III: Embedded Software

Device drivers, Device Drivers for interrupt-Handling, Memory device drivers, On-board bus device drivers, Board I/O drivers, Explanation about above drivers with suitable examples.

Embedded operating systems – Multitasking and process Management, Memory Management, I/O and file system management, OS standards example – POSIX, OS performance guidelines, Board support packages, Middleware and Application Software – Middle ware, Middleware examples, Application layer software examples.


Embedded system design and development lifecycle model, creating an embedded system architecture, introduction to embedded software development process and tools- Host and Target machines, linking and locating software, Getting embedded software into the target system, issues in Hardware-Software design and co-design.

Implementing the design-The main software utility tool, CAD and the hardware, Translation tools, Debugging tools, testing on host machine, simulators, Laboratory tools, System Boot-Up.
UNIT-V: Embedded System Design-Case Studies

Case studies- Processor design approach of an embedded system –Power PC Processor based and Micro Blaze Processor based Embedded system design on Xilinx platform-NiosII Processor based Embedded system design on Altera platform-Respective Processor architectures should be taken into consideration while designing an Embedded System.

TEXT BOOKS:


REFERENCE BOOKS:


UNIT -I:  
Introduction:  

UNIT -II:  
Detection of Radar Signals in Noise:  

UNIT -III:  
Waveform Selection [3, 2]:  

UNIT -IV:  
Pulse Compression in Radar Signals:  

UNIT V:  
Phase Coding Techniques:  
Principles, Binary Phase Coding, Barker Codes, Maximal Length Sequences (MLS/LRS/PN), Block Diagram of a Phase Coded CW Radar. Poly Phase Codes : Frank Codes, Costas Codes, Non-Linear FM Pulse Compression, Doppler Tolerant PC Waveforms – Short Pulse, Linear Period Modulation (LPM/HFM), Sidelobe Reduction for Phase Coded PC Signals.
TEXT BOOKS:

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**NETWORK SECURITY AND CRYPTOGRAPHY**

**UNIT -I:**
**Introduction:**

**Modern Techniques:**
Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operations.

**UNIT -II:**
**Encryption Algorithms:**

**UNIT -III:**
**Public Key Cryptography:** Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography. Number Theory: Prime and Relatively prime numbers, Modular arithmetic, Fermat’s and Euler’s theorems, Testing for primality, Euclid’s Algorithm, the Chinese remainder theorem, Discrete logarithms.

**UNIT -IV:**
**Message Authentication and Hash Functions:** Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs. Hash and Mac Algorithms

**Authentication Applications:** Kerberos, X.509 directory Authentication service. Electronic Mail Security: Pretty Good Privacy, S/MIME.

**UNIT –V:**
**IP Security:**

**Intruders, Viruses and Worms**
Intruders, Viruses and Related threats.

**Fire Walls:** Fire wall Design Principles, Trusted systems.
TEXT BOOKS:

REFERENCE BOOKS:
1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
5. Introduction to Cryptography, Buchmann, Springer.
ADVANCED COMMUNICATIONS LAB

Note:

A. Minimum of 10 Experiments have to be conducted
B. All Experiments may be Simulated using MATLAB and to be verified using related training kits.
   1. Measurement of Bit Error Rate using Binary Data
   2. Verification of minimum distance in Hamming code
   3. Determination of output of Convolutional Encoder for a given sequence
   4. Determination of output of Convolutional Decoder for a given sequence
   5. Efficiency of DS Spread- Spectrum Technique
   6. Simulation of Frequency Hopping (FH) system
   7. Effect of Sampling and Quantization of Digital Image
   8. Verification of Various Transforms (FT / DCT/ Walsh / Hadamard) on a given Image (Finding Transform and Inverse Transform)
   9. Point, Line and Edge detection techniques using derivative operators.
  10. Implementation of FIR filter using DSP Trainer Kit (C-Code/ Assembly code)
  11. Implementation of IIR filter using DSP Trainer Kit (C-Code/ Assembly code)
  12. Determination of Losses in Optical Fiber
  13. Observing the Waveforms at various test points of a mobile phone using Mobile Phone Trainer
  15. Study of ISDN Training System with Protocol Analyzer
ACADEMIC REGULATIONS & COURSE STRUCTURE

For

COMMUNICATION SYSTEMS

(Applicable for batches admitted from 2016-2017)
## I Semester

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<td>Optical Communication Technology</td>
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<td>II. Mobile Computing Technologies</td>
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<td>III. Network Security &amp; Cryptography</td>
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**Total Credits**: 20

## II Semester

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<td>Image and Video Processing</td>
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<td>I. Soft Computing Techniques</td>
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<td>II. Internet Protocols</td>
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<td>II. DSP Processors and Architectures</td>
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**Total Credits**: 20
### III Semester

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**Total Credits** 20

### IV Semester

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**Total Credits** 20
UNIT –I:
Random Processes:
Discrete Linear Models, Markov Sequences and Processes, Point Processes, and Gaussian Processes.

UNIT –II:
Detection Theory:
Basic Detection Problem, Maximum A posteriori Decision Rule, Minimum Probability of Error Classifier, Bayes Decision Rule, Multiple-Class Problem (Bayes)- minimum probability error with and without equal a priori probabilities, Neyman-Pearson Classifier, General Calculation of Probability of Error, General Gaussian Problem, Composite Hypotheses.

UNIT –III:
Linear Minimum Mean-Square Error Filtering:
Linear Minimum Mean Squared Error Estimators, Nonlinear Minimum Mean Squared Error Estimators. Innovations, Digital Wiener Filters with Stored Data, Real-time Digital Wiener Filters, Kalman Filters.

UNIT –IV:
Statistics:

UNIT –V:
Estimating the Parameters of Random Processes from Data:

TEXT BOOKS:
REFERENCE BOOKS:

3. Introduction to Statistical Signal Processing with Applications - Srinath, Rajasekaran, Viswanathan, 2003, PHI.
UNIT -I:
Digital Modulation Schemes:
BPSK, QPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK – Methods, Band Width Efficiency, Carrier Recovery, Clock Recovery.

UNIT -II:
Basic Concepts of Data Communications, Interfaces and Modems:

UNIT -III:
Error Correction: Types of Errors, Vertical Redundancy Check (VRC), LRC, CRC, Checksum, Error Correction using Hamming code
Data Link Control: Line Discipline, Flow Control, Error Control

UNIT -IV:
Multiplexing: Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Multiplexing Application, DSL.
Local Area Networks: Ethernet, Other Ether Networks, Token Bus, Token Ring, FDDI.
Metropolitan Area Networks: IEEE 802.6, SMDS
Switching: Circuit Switching, Packet Switching, Message Switching.
Networking and Interfacing Devices: Repeaters, Bridges, Routers, Gateway, Other Devices.

UNIT -V:
Multiple Access Techniques:
Frequency- Division Multiple Access (FDMA), Time - Division Multiple Access (TDMA), Code - Division Multiple Access (CDMA), OFDM and OFDMA. Random Access, Aloha- Carrier Sense Multiple Access (CSMA)- Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA), Controlled Access- Reservation- Polling- Token Passing, Channelization.

TEXT BOOKS:
REFERENCE BOOKS:
1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
UNIT –I:
**Signal propagation in Optical Fibers:**

UNIT –II:
**Fiber Optic Components for Communication & Networking:**
Couplers, Isolators and Circulators, Multiplexers, Bragg Gratings, Fabry-Perot Filters, Mach Zender Interferometers, Arrayed Waveguide Grating, Tunable Filters, High Channel Count Multiplexer Architectures, Optical Amplifiers, Direct and External Modulation Transmitters, Pump Sources for Amplifiers, Optical Switches and Wavelength Converters.

UNIT –III:
**Modulation and Demodulation:**

UNIT -IV:
**Transmission System Engineering:**
System Model, Power Penalty in Transmitter and Receiver, Optical Amplifiers, Crosstalk and Reduction of Crosstalk, Cascaded Filters, Dispersion Limitations and Compensation Techniques.

UNIT –V:
**Fiber Non-linearities and System Design Considerations:**
Limitation in High Speed and WDM Systems due to Non-linearities in Fibers, Wavelength Stabilization against Temperature Variations, Overall System Design considerations – Fiber Dispersion, Modulation, Non-Linear Effects, Wavelengths, All Optical Networks.

**TEXT BOOKS:**
REFERENCE BOOKS:
ADVANCED DIGITAL SIGNAL PROCESSING

UNIT –I:
Review of DFT, FFT, IIR Filters and FIR Filters:
Multi Rate Signal Processing: Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion.

UNIT –II:
Applications of Multi Rate Signal Processing:

UNIT -III:
Non-Parametric Methods of Power Spectral Estimation: Estimation of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods

UNIT –IV:
Implementation of Digital Filters:
Introduction to filter structures (IIR & FIR), Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

UNIT –V:

TEXT BOOKS:
REFERENCE BOOKS:
UNIT -I:
Introduction:

UNIT -II:
Detection of Radar Signals in Noise:

UNIT -III:
Waveform Selection [3, 2]:

UNIT -IV:
Pulse Compression in Radar Signals:
UNIT V:

**Phase Coding Techniques:**
Principles, Binary Phase Coding, Barker Codes, Maximal Length Sequences (MLS/LRS/PN), Block Diagram of a Phase Coded CW Radar.
Poly Phase Codes: Frank Codes, Costas Codes, Non-Linear FM Pulse Compression, Doppler Tolerant PC Waveforms – Short Pulse, Linear Period Modulation (LPM/HFM), Sidelobe Reduction for Phase Coded PC Signals.

**TEXT BOOKS:**

**REFERENCE BOOKS:**
UNIT -I:  
**Introduction to RF Electronics:**  

UNIT -II:  
**Transmission Line Analysis:** Examples of transmission lines- Transmission line equations and Biasing- Micro Strip Transmission Lines- Special Termination Conditions- sourced and Loaded Transmission Lines. **Single And Multiport Networks:** The Smith Chart, Interconnectivity networks, Network properties and Applications, Scattering Parameters.

UNIT -III:  
**Matching and Biasing Networks:**  

UNIT -IV:  
**RF Transistor Amplifier Design:** Characteristics of Amplifiers - Amplifier Circuit Configurations, Amplifier Matching Basics, Distortion and noise products, Stability Considerations, Small Signal amplifier design, Power amplifier design, MMIC amplifiers, Broadband High Power multistage amplifiers, Low noise amplifiers, VGA Amplifiers.

UNIT -V:  
**Oscillators:** Oscillator basics, Low phase noise oscillator design, High frequency Oscillator configuration, LC Oscillators, VCOs, Crystal Oscillators, PLL Synthesizer, and Direct Digital Synthesizer. **RF Mixers:** Basic characteristics of a mixer - Active mixers- Image Reject and Harmonic mixers, Frequency domain considerations.
TEXT BOOKS:

REFERENCE BOOKS:
1. Radio frequency and Microwave Electronics - Mathew M.Radmangh, 2001, PE Asia Publ.
2. RF Circuit Design – Christopher Bowick, Cheryl Aljunii and John Biyley, Elsevier Science, 2008.
UNIT -I:
Congestion and Quality of Service (QoS):
Data traffic, Congestion, Congestion Control, Two examples, Quality of Service, Techniques to improve QOS, Integrated Services and Differential services. Queue Management: Passive-Drop trial, Drop front, Random drop, Active- early Random drop, Random Early detection.

UNIT -II:

UNIT -III:

UNIT -IV:

UNIT -V:
TEXT BOOKS:
3. Data Communication and Networking - B. A. Forouzan, 4th Ed, TMH

REFERENCE BOOKS:
7. Wireless Communication System- Abhishek Yadav, University Sciences Press
UNIT –I:
Wireless System & Random Access Protocols:

UNIT –II:
Wireless LANs:
Introduction, importance of Wireless LANs, WLAN Topologies, Transmission Techniques: Wired Networks, Wireless Networks, comparison of wired and Wireless LANs; WLAN Technologies: Infrared technology, UHF narrowband technology, Spread Spectrum technology

UNIT –III:
The IEEE 802.11 Standard for Wireless LANs:
Network Architecture, Physical layer, The Medium Access Control Layer; MAC Layer issues: Hidden Terminal Problem, Reliability, Collision avoidance, Congestion avoidance, Congestion control, Security, The IEEE 802.11e MAC protocol

UNIT –IV:
Wireless PANs:
Introduction, importance of Wireless PANs, The Bluetooth technology: history and applications, technical overview, the Bluetooth specifications, piconet synchronization and Bluetooth clocks, Master-Slave Switch; Bluetooth security; Enhancements to Bluetooth: Bluetooth interference issues, Intra and Inter Piconet scheduling, Bridge selection, Traffic Engineering, QoS and Dynamics Slot Assignment, Scatternet formation.

UNIT –V:
The IEEE 802.15 working Group for WPANs:
The IEEE 802.15.3, The IEEE 802.15.4, ZigBee Technology, ZigBee components and network topologies, The IEEE 802.15.4 LR-WPAN Device architecture: Physical Layer, Data Link Layer, The Network Layer, Applications; IEEE 802.15.3a Ultra wideband.
TEXT BOOKS:

REFERENCE BOOKS
MOBILE COMPUTING TECHNOLOGIES
(ELECTIVE – II)

UNIT –I:
Introduction to Mobile Computing Architecture:

UNIT –II:
Cellular Technologies: GSM, GPS, GPRS, CDMA and 3G:

UNIT –III:
Wireless Application Protocol (WAP) and Wireless LAN:
Intelligent Networks and Interworking:
Introduction – Fundamentals of Call processing – Intelligence in the Networks – SS#7 Signaling – IN Conceptual Model (INCM) – soft switch – Programmable Networks – Technologies and Interfaces for IN

UNIT –IV:
Client Programming, Palm OS, Symbian OS, Win CE Architecture:
J2ME:
UNIT –V:
Voice Over Internet Protocol and Convergence:

Security Issues in Mobile Computing:

TEXT BOOKS:

REFERENCE BOOKS:
UNIT -I:
Introduction:
Modern Techniques:
Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operations.

UNIT -II:
Encryption Algorithms:

UNIT -III:
Public Key Cryptography: Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography. Number Theory: Prime and Relatively prime numbers, Modular arithmetic, Fermat’s and Euler’s theorems, Testing for primality, Euclid’s Algorithm, the Chinese remainder theorem, Discrete logarithms.

UNIT -IV:
UNIT –V:

IP Security:

Intruders, Viruses and Worms
Intruders, Viruses and Related threats.

Fire Walls: Fire wall Design Principles, Trusted systems.

TEXT BOOKS:


REFERENCE BOOKS:

10. Introduction to Cryptography, Buchmann, Springer.
OPTICAL AND DATA COMMUNICATIONS LAB

Optical communications Experiments

1. D.C Characteristics of light sources /detectors (LED, Laser diode and PIN photo diode.)
4. Analog link set up using a fiber
5. Digital link set up using a fiber
6. Set up of time division multiplexing using fiber optics
7. Digital Fiber Optical Transmitter and Receiver

Data Communications Experiments

10. Study of pc to pc communication using parallel port
11. To establish pc-pc communication using LAN
12. Study of LAN using star topology, bus topology and tree topology
13. Study and configure modem of a computer
14. To configure a hub/switch
15. To study the interconnections of cables for data communication
16. Study of a wireless communication system
UNIT –I:
Coding for Reliable Digital Transmission and Storage:
Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

Linear Block Codes:
Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

UNIT –II:
Cyclic Codes:
Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding, Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT –III:
Convolutional Codes:
Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT –IV:
Burst –Error-Correcting Codes:

UNIT -V:
BCH – Codes:
BCH code- Definition, Minimum distance and BCH Bounds, Decoding Procedure for BCH Codes- Syndrome Computation and Iterative Algorithms, Error Location Polynomials and Numbers for single and double error correction
TEXT BOOKS:

REFERENCE BOOKS:
1. Digital Communications-Fundamental and Application - Bernard Sklar, PE.
3. Introduction to Error Control Codes-Salvatore Gravano-oxford
5. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Ed, 2009, TMH.
UNIT -I:
The Cellular Concept-System Design Fundamentals:
Introduction, Frequency Reuse, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference, Power Control for Reducing interference, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Trunking and Grade of Service

UNIT –II:
Mobile Radio Propagation: Large-Scale Path Loss:

UNIT –III:
Mobile Radio Propagation: Small –Scale Fading and Multipath
Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke’s model for flat fading, spectral shape due to Doppler spread in Clarke’s model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.
UNIT -IV:
**Equalization and Diversity**

UNIT -V:
**Wireless Networks**
Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, HiperLan, WLL.

TEXT BOOKS:

REFERENCE BOOKS:
UNIT –I:  
**Fundamentals of Image Processing and Image Transforms:**  
Introduction, Image sampling, Quantization, Resolution, Image file formats, Elements of image processing system, Applications of Digital image processing  
Introduction, Need for transform, image transforms, Fourier transform, 2D Discrete Fourier transform and its transforms, Importance of phase, Walsh transform, Hadamard transform, Haar transform, slant transform, Discrete cosine transform, KL transform, singular value decomposition, Radon transform, comparison of different image transforms.

UNIT –II:  
**Image Enhancement:**  
Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters.  
Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.  
**Image Restoration:**  
Introduction to Image restoration, Image degradation, Types of image blur, Classification of image restoration techniques, Image restoration model, Linear and Nonlinear image restoration techniques, Blind deconvolution

UNIT –III:  
**Image Segmentation:**  
Introduction to image segmentation, Point, Line and Edge Detection, Region based segmentation, Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding, Edge based segmentation, Edge detection and linking, Hough transform, Active contour  
**Image Compression:**  

UNIT -IV:  
**Basic Steps of Video Processing:**  
UNIT –V:

2-D Motion Estimation:
Optical flow, General Methodologies, Pixel Based Motion Estimation, Block- Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.

TEXT BOOKS:

REFERENCE BOOKS:
UNIT -I:
Introduction:
The Need for Software Radios, What is Software Radio, Characteristics and benefits of software radio- Design Principles of Software Radio, RF Implementation issues- The Purpose of RF Front – End, Dynamic Range- The Principal Challenge of Receiver Design – RF Receiver Front- End Topologies- Enhanced Flexibility of the RF Chain with Software Radios- Importance of the Components to Overall Performance- Transmitter Architectures and Their Issues- Noise and Distortion in the RF Chain, ADC and DAC Distortion.

UNIT -II:
Multi Rate Signal Processing:
Introduction- Sample Rate Conversion Principles- Polyphase Filters- Digital Filter Banks-Timing Recovery in Digital Receivers Using Multirate Digital Filters.
Digital Generation of Signals:

UNIT -III:
Analog to Digital and Digital to Analog Conversion:
Parameters of ideal data converters- Parameters of Practical data converters- Analog to Digital and Digital to Analog Conversion- Techniques to improve data converter performance- Common ADC and DAC architectures.

UNIT -IV:
Digital Hardware Choices:
Introduction- Key Hardware Elements- DSP Processors- Field Programmable Gate Arrays- Trade-Offs in Using DSPs, FPGAs, and ASICs- Power Management Issues- Using a Combination of DSPs, FPGAs, and ASICs.

UNIT -V:
Object – Oriented Representation of Radios and Network Resources:
Networks- Object Oriented Programming- Object Brokers- Mobile Application Environments- Joint Tactical Radio System.

TEXT BOOKS:

REFERENCE BOOKS:
UNIT –I:
Introduction:
Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, Knowledge representation - Expert systems.

UNIT –II:
Artificial Neural Networks:
Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron, Learning and Training the neural network, Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.

UNIT –III:
Fuzzy Logic System:
Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modeling and control schemes for nonlinear systems, Self-organizing fuzzy logic control, Fuzzy logic control for nonlinear timedelay system.

UNIT –IV:
Genetic Algorithm:
Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search and And-colony search techniques for solving optimization problems.

UNIT –V:
Applications:
TEXT BOOKS:


REFERENCE BOOKS:

UNIT -I:

**Internetworking Concepts:**

**IP Address:**

**Classful Addressing:** Introduction, Classful Addressing, Other Issues, Sub-netting and Super-netting

**Classless Addressing:** Variable length Blocks, Sub-netting, Address Allocation. Delivery, Forwarding, and Routing of IP Packets: Delivery, Forwarding, Routing, Structure of Router.

**ARP and RARP:** ARP, ARP Package, RARP.

UNIT -II:

**Internet Protocol (IP):** Datagram, Fragmentation, Options, Checksum, IP V.6.

**Transmission Control Protocol (TCP):** TCP Services, TCP Features, Segment, A TCP Connection, State Transition Diagram, Flow Control, Error Control, Congestion Control, TCP Times.

**Stream Control Transmission Protocol (SCTP):** SCTP Services, SCTP Features, Packet Format, Flow Control, Error Control, Congestion Control.

**Mobile IP:** Addressing, Agents, Three Phases, Inefficiency in Mobile IP.

**Classical TCP Improvements:** Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit/Fast Recovery, Transmission/Time Out Freezing, Selective Retransmission, Transaction Oriented TCP.

UNIT -III:

**Unicast Routing Protocols (RIP, OSPF, and BGP):** Intra and Inter-domain Routing, Distance Vector Routing, RIP, Link State Routing, OSPF, Path Vector Routing, BGP.

**Multicasting and Multicast Routing Protocols:** Unicast - Multicast- Broadcast, Multicast Applications, Multicast Routing, Multicast Link State Routing: MOSPF, Multicast Distance Vector: DVMRP.
UNIT -IV:
Domain Name System (DNS): Name Space, Domain Name Space, Distribution of Name Space, and DNS in the internet.
Remote Login TELNET: Concept, Network Virtual Terminal (NVT).
Electronic Mail: SMTP and POP.

UNIT -V:
Multimedia:

TEXT BOOKS:
4. Internetworking with TCP/IP Comer 3 rd edition PHI

REFERENCE BOOKS:
<table>
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CYBER SECURITY
UNIT –I:
Client Layers of Optical Networks:

UNIT -II:
WDM network Elements and Design:

UNIT –III:
Network Control and Management:

Unit –IV:
Network Survivability:

UNIT –V:
Access Networks and Photonic Packet Switching:
Network Architecture, Enhanced HFC, FTTC, Photonic Packet Switching – OTDM, Synchronization, Header Processing, Buffering, Burst Switching, Test Beds.

TEXT BOOKS:
REFERENCE BOOKS:
UNIT –I:
Introduction to Digital Signal Processing:
Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation.

Computational Accuracy in DSP Implementations:
Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT –II:
Architectures for Programmable DSP Devices:
Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT -III:
Programmable Digital Signal Processors:
Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline operation of TMS320C54XX Processors.

UNIT –IV:
Analog Devices Family of DSP Devices:
Introduction to Blackfin Processor - The Blackfin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.

UNIT –V:
Interfacing Memory and I/O Peripherals to Programmable DSP Devices:
Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).
TEXT BOOKS:

REFERENCE BOOKS:
4. Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI
UNIT –I:
Navigational Systems:

UNIT -II:
Inertial Navigation:
Inertial navigation system, Sensing instruments: Accelerometer, Gyro- copes, Analytic and Gimbaled platforms, Mechanization, Error analysis, Alignment.

UNIT –III:
Global Positioning System (GPS) for Navigation:
Overview of GPS, Reference systems, Satellite orbits, Signal structure, Geometric dilution of precision (GDOP), or Precision dilution of recision (PDOP), Satellite ephemeris, Satellite clock, Ionospheric group delay, Tropospheric group delay, Multipath errors and Receiver measurement errors.

UNIT -IV:
Differential GPS and WAAS:
Standard and precise positioning service local area DGPS and Wide area DGPS errors, Wide Area Augmentation System (WAAS) architecture, Link budget and Data Capacity, Ranging function, Precision approach and error estimates.

UNIT –V:
GPS Navigational Applications:
General applications of GPS, DGPS, Marine, Air and Land Navigation, Surveying, Mapping and Geographical information systems, Military and Space.

TEXT BOOKS:
REFERENCE BOOKS:
2. Elliot D. Kaplan - “Understanding GPS Principles and Applications”, Artech House. Inc.,
   1996.
ADVANCED COMMUNICATIONS LAB

Note:

C. Minimum of 10 Experiments have to be conducted
D. All Experiments may be Simulated using MATLAB and to be verified using related training kits.
   1. Measurement of Bit Error Rate using Binary Data
   2. Verification of minimum distance in Hamming code
   3. Determination of output of Convolutional Encoder for a given sequence
   4. Determination of output of Convolutional Decoder for a given sequence
   5. Efficiency of DS Spread-Spectrum Technique
   6. Simulation of Frequency Hopping (FH) system
   7. Effect of Sampling and Quantization of Digital Image
   8. Verification of Various Transforms (FT / DCT/ Walsh / Hadamard) on a given Image (Finding Transform and Inverse Transform)
   9. Point, Line and Edge detection techniques using derivative operators.
   10. Implementation of FIR filter using DSP Trainer Kit (C-Code/ Assembly code)
   11. Implementation of IIR filter using DSP Trainer Kit (C-Code/ Assembly code)
   12. Determination of Losses in Optical Fiber
   13. Observing the Waveforms at various test points of a mobile phone using Mobile Phone Trainer
   15. Study of ISDN Training System with Protocol Analyzer
ACADEMIC REGULATIONS & COURSE STRUCTURE

For

DECS, ECE, DECE

(Applicable for batches admitted from 2016-2017)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India
### I Semester

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<td>Detection &amp; Estimation Theory</td>
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<td>Digital Data Communications</td>
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<td>I. Transform Techniques</td>
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<td>III. Network Security &amp; Cryptography</td>
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### II Semester

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<td>Image and Video Processing</td>
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<td>II. Advanced Computer Architecture</td>
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<td>I. DSP Processors and Architectures</td>
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<td>II. EMI / EMC</td>
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<td>III. Object Oriented Programming</td>
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<td>Advanced Communications Laboratory</td>
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### III Semester

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### IV Semester

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</table>
UNIT-I: Minimization Procedures and CAMP Algorithm:

Review on minimization of switching functions using tabular methods, k-map, QM algorithm, CAMP-I algorithm, Phase-I: Determination of Adjacencies, DA, CSC, SSMs and EPCs., CAMP-I algorithm, Phase-II: Passport checking, Determination of SPC, CAMP-II algorithm: Determination of solution cube, Cube based operations, determination of selected cubes are wholly within the given switching function or not, Introduction to cube based algorithms.

UNIT-II: PLA Design, Minimization and Folding Algorithms:

Introduction to PLDs, basic configurations and advantages of PLDs, PLA-Introduction, Block diagram of PLA, size of PLA, PLA design aspects, PLA minimization algorithm (IISc algorithm), PLA folding algorithm (COMPACT algorithm)-Illustration of algorithms with suitable examples.

UNIT-III: Design of Large Scale Digital Systems:

Algorithmic state machinecharts-Introduction, Derivation of SM Charts, Realization of SM Chart, control implementation, control unit design, data processor design, ROM design, PAL design aspects, digital system design approaches using CPLDs, FPGAs and ASICs.

UNIT-IV: Fault Diagnosis in Combinational Circuits:

Faults classes and models, fault diagnosis and testing, fault detection test, test generation, testing process, obtaining a minimal complete test set, circuit under test methods- Path sensitization method, Boolean difference method, properties of Boolean differences, Kohavi algorithm, faults in PLAs, DFT schemes, built in self-test.

UNIT-V: Fault Diagnosis in Sequential Circuits:

Fault detection and location in sequential circuits, circuit test approach, initial state identification, Hamming experiments, synchronizing experiments, machine identification, distinguishing experiment, adaptive distinguishing experiments.

TEXT BOOKS:

1. Logic Design Theory-N. N. Biswas, PHI
3. Digital system Design using PLDd-Lala

REFERENCE BOOKS:

UNIT –I:
Random Processes:
Discrete Linear Models, Markov Sequences and Processes, Point Processes, and Gaussian Processes.

UNIT –II:
Detection Theory:
Basic Detection Problem, Maximum A posteriori Decision Rule, Minimum Probability of Error Classifier, Bayes Decision Rule, Multiple-Class Problem (Bayes)- minimum probability error with and without equal a priori probabilities, Neyman-Pearson Classifier, General Calculation of Probability of Error, General Gaussian Problem, Composite Hypotheses.

UNIT –III:
Linear Minimum Mean-Square Error Filtering:
Linear Minimum Mean Squared Error Estimators, Nonlinear Minimum Mean Squared Error Estimators. Innovations, Digital Wiener Filters with Stored Data, Real-time Digital Wiener Filters, Kalman Filters.

UNIT –IV:
Statistics:

UNIT –V:
Estimating the Parameters of Random Processes from Data:

TEXT BOOKS:
REFERENCE BOOKS:
3. Introduction to Statistical Signal Processing with Applications - Srinath, Rajasekaran, Viswanathan, 2003, PHI.
UNIT -I:
Digital Modulation Schemes:
BPSK, QPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK – Methods, Band Width Efficiency, Carrier Recovery, Clock Recovery.

UNIT -II:
Basic Concepts of Data Communications, Interfaces and Modems:

UNIT -III:
Error Correction: Types of Errors, Vertical Redundancy Check (VRC), LRC, CRC, Checksum, Error Correction using Hamming code
Data Link Control: Line Discipline, Flow Control, Error Control

UNIT -IV:
Multiplexing: Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Multiplexing Application, DSL.
Local Area Networks: Ethernet, Other Ether Networks, Token Bus, Token Ring, FDDI.
Metropolitan Area Networks: IEEE 802.6, SMDS
Switching: Circuit Switching, Packet Switching, Message Switching.
Networking and Interfacing Devices: Repeaters, Bridges, Routers, Gateway, Other Devices.

UNIT -V:
Multiple Access Techniques:
Frequency- Division Multiple Access (FDMA), Time - Division Multiple Access (TDMA), Code - Division Multiple Access (CDMA), OFDM and OFDMA. Random Access, Aloha- Carrier Sense Multiple Access (CSMA)- Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA), Controlled Access- Reservation- Polling- Token Passing, Channelization.

TEXT BOOKS:
REFERENCE BOOKS:
1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
UNIT –I:  
**Review of DFT, FFT, IIR Filters and FIR Filters:**  
**Multi Rate Signal Processing:** Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion.

UNIT –II:  
**Applications of Multi Rate Signal Processing:**  

UNIT –III:  
**Non-Parametric Methods of Power Spectral Estimation:** Estimation of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods

UNIT –IV:  
**Implementation of Digital Filters:**  
Introduction to filter structures (IIR & FIR), Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

UNIT –V:  

**TEXT BOOKS:**  
REFERENCE BOOKS:
UNIT -I:
Fourier Analysis:

UNIT -II:
Transforms:
Walsh, Hadamard, Haar and Slant Transforms, DCT, DST, KLT, Singular value Decomposition – definition, properties and applications

UNIT -III:
Continuous Wavelet Transform (CWT):
Short comings of STFT, Need for wavelets, Wavelet Basis- Concept of Scale and its relation with frequency, Continuous time wavelet Transform Equation- Series Expansion using Wavelets- CWT- Tiling of time scale plane for CWT. Important Wavelets: Haar, Mexican Hat, Meyer, Shannon, Daubechies.

UNIT -IV:
Multi Rate Analysis and DWT:
Need for Scaling function – Multi Resolution Analysis, Two-Channel Filter Banks, Perfect Reconstruction Condition, Relationship between Filter Banks and Wavelet Basis, DWT, Structure of DWT Filter Banks, Daubechies Wavelet Function, Applications of DWT.

UNIT -V:
Wavelet Packets and Lifting: Wavelet Packet Transform, Wavelet packet algorithms, Thresholding-Hard thresholding, Soft thresholding, Multidimensional Wavelets, Bi-orthogonal basis- B-Splines, Lifting Scheme of Wavelet Generation, Multi Wavelets

TEXT BOOKS:
REFERENCE BOOKS:

UNIT-I:
**VLSI Technology**: Fundamentals and applications, IC production process, semiconductor processes, design rules and process parameters, layout techniques and process parameters.

**VLSI Design**: Electronic design automation concept, ASIC and FPGA design flows, SOC designs, design technologies: combinational design techniques, sequential design techniques, state machine logic design techniques and design issues.

UNIT-II:
**CMOS VLSI Design**: MOSTechnology and fabrication process of pMOS, nMOS, CMOS and BiCMOS technologies, comparison of different processes.

**Building Blocks of a VLSI circuit**: Computer architecture, memory architectures, communication interfaces, mixed signal interfaces.

**VLSI Design Issues**: Design process, design for testability, technology options, power calculations, package selection, clock mechanisms, mixed signal design.

UNIT-III:
Basic electrical properties of MOS and BiCMOS circuits, MOS and BiCMOS circuit design processes, Basic circuit concepts, scaling of MOS circuits-qualitative and quantitative analysis with proper illustrations and necessary derivations of expressions.

UNIT-IV:
**Subsystem Design and Layout**: Some architectural issues, switch logic, gate logic, examples of structured design (combinational logic), some clocked sequential circuits, other system considerations.

**Subsystem Design Processes**: Some general considerations and an illustration of design processes, design of an ALU subsystem.

UNIT-V:
**Floor Planning**: Introduction, Floor planning methods, off-chip connections.

**Architecture Design**: Introduction, Register-Transfer design, high-level synthesis, architectures for low power, architecture testing.

**Chip Design**: Introduction and design methodologies.

TEXT BOOKS:
REFERENCE BOOKS:

UNIT -I: 
Introduction:

UNIT -II:
Detection of Radar Signals in Noise:

UNIT -III:
Waveform Selection [3, 2]:

UNIT -IV:
Pulse Compression in Radar Signals:

UNIT V:
Phase Coding Techniques:
Principles, Binary Phase Coding, Barker Codes, Maximal Length Sequences (MLS/LRS/PN), Block Diagram of a Phase Coded CW Radar. Poly Phase Codes : Frank Codes, Costas Codes, Non-Linear FM Pulse Compression, Doppler Tolerant PC Waveforms – Short Pulse, Linear Period Modulation (LPM/HFM), Sidelobe Reduction for Phase Coded PC Signals.
TEXT BOOKS:

REFERENCE BOOKS:
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STATISTICAL SIGNAL PROCESSING
(ELECTIVE - II)

UNIT I

Signal models and characterization: Types and properties of statistical models for signals and how they relate to signal processing. Common second-order methods of characterizing signals including autocorrelation, partial correlation, cross-correlation, power spectral density and cross-power spectral density.

UNIT II

Spectral estimation: Nonparametric methods for estimation of power spectral density, autocorrelation, cross-correlation, transfer functions, and coherence from finite signal samples.

UNIT III

Review of signal processing: A review on random processes, a review on filtering random processes, Examples.


UNIT IV

Eigen structure based frequency estimation: Pisarenko, MUSIC, ESPRIT their application sensor array direction finding.

Spectrum estimation: Moving average (MA), Auto Regressive (AR), Auto Regressive Moving Average (ARMA), Various non-parametric approaches.

UNIT V

Wiener filtering: The finite impulse case, causal and non-causal infinite impulse responses cases, least mean squares adaptation, recursive least squares adaptation, Kalman filtering.

TEXT BOOKS:

REFERENCE BOOKS:
UNIT –I:
**Signal propagation in Optical Fibers:**

UNIT –II:
**Fiber Optic Components for Communication & Networking:**
Couplers, Isolators and Circulators, Multiplexers, Bragg Gratings, Fabry-Perot Filters, Mach Zender Interferometers, Arrayed Waveguide Grating, Tunable Filters, High Channel Count Multiplexer Architectures, Optical Amplifiers, Direct and External Modulation Transmitters, Pump Sources for Amplifiers, Optical Switches and Wavelength Converters.

UNIT –III:
**Modulation and Demodulation:**

UNIT -IV:
**Transmission System Engineering:**
System Model, Power Penalty in Transmitter and Receiver, Optical Amplifiers, Crosstalk and Reduction of Crosstalk, Cascaded Filters, Dispersion Limitations and Compensation Techniques.

UNIT –V:
**Fiber Non-linearities and System Design Considerations:**
Limitation in High Speed and WDM Systems due to Non-linearities in Fibers, Wavelength Stabilization against Temperature Variations, Overall System Design considerations – Fiber Dispersion, Modulation, Non-Linear Effects, Wavelengths, All Optical Networks.
TEXT BOOKS:

REFERENCE BOOKS:
UNIT -I:
Introduction:
Modern Techniques:
Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operations.

UNIT -II:
Encryption Algorithms:

UNIT -III:
Public Key Cryptography: Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography. Number Theory: Prime and Relatively prime numbers, Modular arithmetic, Fermat’s and Euler’s theorems, Testing for primality, Euclid’s Algorithm, the Chinese remainder theorem, Discrete logarithms.

UNIT -IV:

UNIT –V:
IP Security:
Intruders, Viruses and Worms
Intruders, Viruses and Related threats.
Fire Walls: Fire wall Design Principles, Trusted systems.
TEXT BOOKS:

REFERENCE BOOKS:
1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
5. Introduction to Cryptography, Buchmann, Springer.
A student has to do at least 6 Experiments from each Part.

Part A:

Systems Design experiments

- The students are required to design the logic to perform the following experiments using necessary Industry standard simulator to verify the logical /functional operation, perform the analysis with appropriate synthesizer and to verify the implemented logic with different hardware modules/kits (CPLD/FPGA kits).
- Consider the suitable switching function and data to implement the required logic if required.

List of Experiments:

11. Determination of EPCs using CAMP-I Algorithm.
12. Determination of SPCs using CAMP-I Algorithm.
14. PLA minimization algorithm (IISc algorithm)
15. PLA folding algorithm(COMPACT algorithm)
16. ROM design.
17. Control unit and data processor logic design
18. Digital system design using FPGA.
20. Hamming experiments.

Lab Requirements:

Software: Industry standard software with perpetual licence consisting of required simulator, synthesizer, analyzer etc. in an appropriate integrated environment.

Hardware: Personal Computer with necessary peripherals, configuration and operating System and relevant VLSI (CPLD/FPGA) hardware Kits.
Part-B:

Data Communications Experiments

1. Study of serial interface RS – 232
2. Study of pc to pc communication using parallel port
3. To establish pc-pc communication using LAN
4. Study of LAN using star topology, bus topology and tree topology
5. Study and configure modem of a computer
6. To configure a hub/switch
7. To study the interconnections of cables for data communication
8. Study of a wireless communication system

Software and Equipment required

- Data Communication Trainer kits
- Computers
- LAN Trainer kit
- ST 5001 Software/ NS2 Software
- Serial and parallel port cables
- Patch cords (2 mm), FOE/LOE Cables, Main power cords
- Ethernet Cables (CAT5, CAT5E, CAT6, CAT7)
- Hubs, Switches, MODEMs
- RS 232 DB25/DB9 Connectors
UNIT –I:
**Coding for Reliable Digital Transmission and Storage:**
Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

**Linear Block Codes:**
Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

UNIT –II:
**Cyclic Codes:**
Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding, Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT –III:
**Convolutional Codes:**
Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT –IV:
**Burst –Error-Correcting Codes:**

UNIT -V:
**BCH – Codes:**
BCH code- Definition, Minimum distance and BCH Bounds, Decoding Procedure for BCH Codes- Syndrome Computation and Iterative Algorithms, Error Location Polynomials and Numbers for single and double error correction
TEXT BOOKS:

REFERENCE BOOKS:
1. Digital Communications-Fundamental and Application - Bernard Sklar, PE.
3. Introduction to Error Control Codes-Salvatore Gravano-oxford
5. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Ed, 2009, TMH.
UNIT-I: Introduction

An Embedded System-Definition, Examples, Current Technologies, Integration in system Design, Embedded system design flow, hardware design concepts, software development, processor in an embedded system and other hardware units, introduction to processor based embedded system design concepts.

UNIT-II: Embedded Hardware

Embedded hardware building blocks, Embedded Processors – ISA architecture models, Internal processor design, processor performance, Board Memory – ROM, RAM, Auxiliary Memory, Memory Management of External Memory, Board Memory and performance.

Embedded board Input / output – Serial versus Parallel I/O, interfacing the I/O components, I/O components and performance, Board buses – Bus arbitration and timing, Integrating the Bus with other board components, Bus performance.

UNIT-III: Embedded Software

Device drivers, Device Drivers for interrupt-Handling, Memory device drivers, On-board bus device drivers, Board I/O drivers, Explanation about above drivers with suitable examples.

Embedded operating systems – Multitasking and process Management, Memory Management, I/O and file system management, OS standards example – POSIX, OS performance guidelines, Board support packages, Middleware and Application Software – Middleware, Middleware examples, Application layer software examples.


Embedded system design and development lifecycle model, creating an embedded system architecture, introduction to embedded software development process and tools- Host and Target machines, linking and locating software, Getting embedded software into the target system, issues in Hardware-Software design and co-design.

Implementing the design-The main software utility tool, CAD and the hardware, Translation tools, Debugging tools, testing on host machine, simulators, Laboratory tools, System Boot-Up.
UNIT-V: Embedded System Design-Case Studies

Case studies- Processor design approach of an embedded system –Power PC Processor based and Micro Blaze Processor based Embedded system design on Xilinx platform-NiosII Processor based Embedded system design on Altera platform-Respective Processor architectures should be taken into consideration while designing an Embedded System.

TEXT BOOKS:


REFERENCE BOOKS:


UNIT –I:
Fundamentals of Image Processing and Image Transforms:
Introduction, Image sampling, Quantization, Resolution, Image file formats, Elements of image processing system, Applications of Digital image processing
Introduction, Need for transform, image transforms, Fourier transform, 2 D Discrete Fourier transform and its transforms, Importance of phase, Walsh transform, Hadamard transform, Haar transform, slant transform Discrete cosine transform, KL transform, singular value decomposition, Radon transform, comparison of different image transforms.

UNIT –II:
Image Enhancement:
Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters.
Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.
Image Restoration:
Introduction to Image restoration, Image degradation, Types of image blur, Classification of image restoration techniques, Image restoration model, Linear and Nonlinear image restoration techniques, Blind deconvolution

UNIT –III:
Image Segmentation:
Introduction to image segmentation, Point, Line and Edge Detection, Region based segmentation, Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding, Edge based segmentation, Edge detection and linking, Hough transform, Active contour
Image Compression:

UNIT -IV:
Basic Steps of Video Processing:
UNIT –V:

2-D Motion Estimation:
Optical flow, General Methodologies, Pixel-Based Motion Estimation, Block-Matching Algorithm, Mesh-based Motion Estimation, Global Motion Estimation, Region-based Motion Estimation, Multi-resolution motion estimation, Waveform-based coding, Block-based transform coding, Predictive coding, Application of motion estimation in Video coding.

TEXT BOOKS:

REFERENCE BOOKS:
UNIT -I:
The Cellular Concept-System Design Fundamentals:
Introduction, Frequency Reuse, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference, Power Control for Reducing interference, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Trunking and Grade of Service

UNIT –II:
Mobile Radio Propagation: Large-Scale Path Loss:

UNIT –III:
Mobile Radio Propagation: Small-Scale Fading and Multipath
Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke’s model for flat fading, spectral shape due to Doppler spread in Clarke’s model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

UNIT -IV:
Equalization and Diversity
Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.

UNIT -V:
Wireless Networks
Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, HiperLan, WLL.

TEXT BOOKS:

REFERENCE BOOKS:
2. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
I Year II Semester

CMOS ANALOG AND DIGITAL IC DESIGN
(Elective-III)

UNIT-I:

MOS Devices and Modeling


MOS Design

Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT-II:

Combinational MOS Logic Circuits:

MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates, AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

Sequential MOS Logic Circuits

Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

UNIT -III:

Dynamic Logic Circuits

Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

Semiconductor Memories

Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory- NOR flash and NAND flash.
UNIT -IV:

Analog CMOS Sub-Circuits

MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT-V:

CMOS Amplifiers

Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

CMOS Operational Amplifiers


TEXT BOOKS:


REFERENCE BOOKS:

3. CMOS: Circuit Design, Layout and Simulation- Baker, Li and Boyce, PHI.

******
ADVANCED COMPUTER ARCHITECTURE (ELECTIVE-I)

UNIT-I: Fundamentals of Computer Design:

Fundamentals of Computer design, Changing faces of computing and task of computer designer, Technology trends, Cost price and their trends, measuring and reporting performance, Quantitative principles of computer design, Amdahl’s law.

Instruction set principles and examples- Introduction, classifying instruction set- memory addressing- type and size of operands, Operations in the instruction set.

UNIT-II:

Pipelines:

Introduction, basic RISC instruction set, Simple implementation of RISC instruction set, Classic five stage pipe lined RISC processor, Basic performance issues in pipelining, Pipeline hazards, Reducing pipeline branch penalties.

Memory Hierarchy Design:


UNIT-III:

Instruction Level Parallelism (ILP)-The Hardware Approach:

Instruction-Level parallelism, Dynamic scheduling, Dynamic scheduling using Tomasulo’s approach, Branch prediction, High performance instruction delivery- Hardware based speculation.

ILP Software Approach:

Basic compiler level techniques, Static branch prediction, VLIW approach, Exploiting ILP, Parallelism at compile time, Cross cutting issues - Hardware verses Software.
UNIT-IV: Multi Processors and Thread Level Parallelism:

Multi Processors and Thread level Parallelism- Introduction, Characteristics of application domain, Systematic shared memory architecture, Distributed shared – Memory architecture, Synchronization.

UNIT-V: Inter Connection and Networks:

Introduction, Interconnection network media, Practical issues in interconnecting networks, Examples of inter connection, Cluster, Designing of clusters.

Intel Architecture: Intel IA-64 ILP in embedded and mobile markets Fallacies and pit falls.

TEXT BOOKS:


REFERENCE BOOKS:

UNIT –I:

Introduction:

Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, Knowledge representation - Expert systems.

UNIT –II:

Artificial Neural Networks:

Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron, Learning and Training the neural network, Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.

UNIT –III:

Fuzzy Logic System:

Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modeling and control schemes for nonlinear systems, Self-organizing fuzzy logic control, Fuzzy logic control for nonlinear timedelay system.

UNIT –IV:

Genetic Algorithm:

Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search and AND-colony search techniques for solving optimization problems.
UNIT –V:

Applications:


TEXT BOOKS:


REFERENCE BOOKS:

I Year II Semester

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Cyber Security
(ELECTIVE - II)
DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES  
(ELECTIVE -IV)

UNIT –I:
Introduction to Digital Signal Processing:
Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation.

Computational Accuracy in DSP Implementations:
Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT –II:
Architectures for Programmable DSP Devices:
Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT -III:
Programmable Digital Signal Processors:
Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline operation of TMS320C54XX Processors.

UNIT –IV:
Analog Devices Family of DSP Devices:

UNIT –V:
Interfacing Memory and I/O Peripherals to Programmable DSP Devices:
Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).
TEXT BOOKS:

REFERENCE BOOKS:
4. Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI
UNIT -I:

Introduction, Natural and Nuclear Sources of EMI / EMC:

Electromagnetic environment, History, Concepts, Practical experiences and concerns, frequency spectrum conservations, An overview of EMI / EMC, Natural and Nuclear sources of EMI.

UNIT -II:

EMI from Apparatus, Circuits and Open Area Test Sites:

Electromagnetic emissions, Noise from relays and switches, Non-linearities in circuits, passive intermodulation, Cross talk in transmission lines, Transients in power supply lines, Electromagnetic interference (EMI), Open area test sites and measurements.

UNIT -III:

Radiated and Conducted Interference Measurements and ESD:

Anechoic chamber, TEM cell, GH TEM Cell, Characterization of conduction currents / voltages, Conducted EM noise on power lines, Conducted EMI from equipment, Immunity to conducted EMI detectors and measurements, ESD, Electrical fast transients / bursts, Electrical surges.

UNIT -IV:

Grounding, Shielding, Bonding and EMI filters:

Principles and types of grounding, Shielding and bonding, Characterization of filters, Power lines filter design.

UNIT -V:

Cables, Connectors, Components and EMC Standards:

EMI suppression cables, EMC connectors, EMC gaskets, Isolation transformers, optoisolators, National / International EMC standards.
TEXT BOOKS:


REFERENCE BOOKS:

OBJECT ORIENTED PROGRAMMING
(ELECTIVE IV)

Objective: Implementing programs for user interface and application development using core Java principles

UNIT I:
Objective: Focus on object oriented concepts and Java program structure and its installation

Introduction to OOP
Introduction, Need of Object Oriented Programming, Principles of Object Oriented Languages, Procedural languages Vs OOP, Applications of OOP, History of JAVA, Java Virtual Machine, Java Features, Installation of JDK1.6

UNIT II:
Objective: Comprehension of Java programming constructs, control structures in Java

Programming Constructs
Variables, Primitive Datatypes, Identifiers- Naming Conventions, Keywords, Literals, Operators- Binary, Unary and ternary, Expressions, Precedence rules and Associativity, Primitive Type Conversion and Casting, Flow of control-Branching, Conditional, loops,
Classes and Objects- classes, Objects, Creating Objects, Methods, constructors-Constructor overloading, Garbage collector, Class variable and Methods-Static keyword, this keyword, Arrays, Command line arguments

UNIT III:
Objective: Implementing Object oriented constructs such as various class hierarchies, interfaces and exception handling

Inheritance: Types of Inheritance, Deriving classes using extends keyword, Method overloading, super keyword, final keyword, Abstract class

Interfaces, Packages and Enumeration: Interface-Extending interface, Interface Vs Abstract classes, Packages-Creating packages, using Packages, Access protection, java.lang package

Exceptions & Assertions - Introduction, Exception handling techniques-try...catch, throw, throws, finally block, user defined exception, Assertions

UNIT IV:
Objective: Understanding of Thread concepts and I/O in Java

MultiThreading: java.lang.Thread, The main Thread, Creation of new threads, Thread priority, Multithreading, Synchronization, suspending and Resuming threads, Communication between Threads

Input/Output: reading and writing data, java.io package
UNIT V:
Objective: Being able to build dynamic user interfaces using applets and Event handling in java

Applets- Applet class, Applet structure, An Example Applet Program, Applet Life Cycle, paint(), update() and repaint()
Event Handling -Introduction, Event Delegation Model, java.awt.event Description, Event Listeners, Adapter classes, Inner classes

UNIT VI:
Objective: Understanding of various components of Java AWT and Swing and writing code snippets using them

Abstract Window Toolkit
Why AWT?, java.awt package, Components and Containers, Button, Label, Checkbox, Radio buttons, List boxes, Choice boxes, Text field and Text area, container classes, Layouts, Menu, Scroll bar
Swing: Introduction, JFrame, JApplet, JPanel, Components in swings, Layout Managers, JList and JScrollPane, Split Pane, JTabbedPane, Dialog Box

Text Books:

1. The Complete Refernce Java, 8ed, Herbert Schildt, TMH
3. JAVA for Beginners, 4e, Joyce Farrell, Ankit R. Bhavsar, Cengage Learning.
4. Object oriented programming with JAVA, Essentials and Applications, Raj Kumar Bhuyya, Selvi, Chu TMH
5. Introduction to Java rogramming, 7th ed, Y Daniel Liang, Pearson

Reference Books:

1. JAVA Programming, K.Rajkumar.Pearson
2. Core JAVA, Black Book, NageswaraRao, Wiley, Dream Tech
3. Core JAVA for Beginners, RashmiKanta Das, Vikas.
ADVANCED COMMUNICATIONS LAB

Note:

E. Minimum of 10 Experiments have to be conducted
F. All Experiments may be Simulated using MATLAB and to be verified using related training kits.

1. Measurement of Bit Error Rate using Binary Data
2. Verification of minimum distance in Hamming code
3. Determination of output of Convolutional Encoder for a given sequence
4. Determination of output of Convolutional Decoder for a given sequence
5. Efficiency of DS Spread- Spectrum Technique
6. Simulation of Frequency Hopping (FH) system
7. Effect of Sampling and Quantization of Digital Image
8. Verification of Various Transforms (FT / DCT/ Walsh / Hadamard) on a given Image (Finding Transform and Inverse Transform)
9. Point, Line and Edge detection techniques using derivative operators.
10. Implementation of FIR filter using DSP Trainer Kit (C-Code/ Assembly code)
11. Implementation of IIR filter using DSP Trainer Kit (C-Code/ Assembly code)
12. Determination of Losses in Optical Fiber
13. Observing the Waveforms at various test points of a mobile phone using Mobile Phone Trainer
15. Study of ISDN Training System with Protocol Analyzer
ACADEMIC REGULATIONS & COURSE STRUCTURE

For

DSCE

(Applicable for batches admitted from 2016-2017)
I Semester

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<td>Digital System Design</td>
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<td>2</td>
<td>VLSI Technology and Design</td>
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<td>Digital Data Communications</td>
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<td>I. Wireless Communications and Networks</td>
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<td>II. Digital Design Using HDL</td>
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<td>I. Software Defined Radio</td>
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<td>II. Network Security and Cryptography</td>
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<td>III. Image &amp; Video Processing</td>
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<td>System Design &amp; Data Communications Lab</td>
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II Semester

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<td>2</td>
<td>CMOS Analog and Digital IC Design</td>
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<td>DSP Processors &amp; Architecture</td>
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<td>Design for Testability</td>
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<td>I. System On Chip Design</td>
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<td>I. Embedded Real Time Operating Systems</td>
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### III Semester

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### IV Semester

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UNIT -I:
Minimization and Transformation of Sequential Machines:
The Finite State Model – Capabilities and limitations of FSM, State equivalence and Machine minimization, Simplification of incompletely specified machines.

UNIT -II:
Digital Design:
Digital Design Using ROMs, PALs and PLAs , BCD Adder, 32 – bit adder, State graphs for control circuits, Scoreboard and Controller, A shift and add multiplier, Array multiplier, Keypad Scanner, Binary divider.

UNIT -III:
SM Charts:
State machine charts, Derivation of SM Charts, Realization of SM Chart, Implementation of Binary Multiplier, dice game controller.

UNIT -IV:
Fault Modeling & Test Pattern Generation:

UNIT -V:
Fault Diagnosis in Sequential Circuits:
Circuit Test Approach, Transition Check Approach – State identification and fault detection experiment, Machine identification, Design of fault detection experiment
TEXT BOOKS:
3. Logic Design Theory – N. N. Biswas, PHI

REFERENCE BOOKS:
UNIT-I:

**VLSI Technology**: Fundamentals and applications, IC production process, semiconductor processes, design rules and process parameters, layout techniques and process parameters.

**VLSI Design**: Electronic design automation concept, ASIC and FPGA design flows, SOC designs, design technologies: combinational design techniques, sequential design techniques, state machine logic design techniques and design issues.

UNIT-II:

**CMOS VLSI Design**: MOSTechnology and fabrication process of pMOS, nMOS, CMOS and BiCMOS technologies, comparison of different processes.

**Building Blocks of a VLSI circuit**: Computer architecture, memory architectures, communication interfaces, mixed signal interfaces.

**VLSI Design Issues**: Design process, design for testability, technology options, power calculations, package selection, clock mechanisms, mixed signal design.

UNIT-III:

Basic electrical properties of MOS and BiCMOS circuits, MOS and BiCMOS circuit design processes, Basic circuit concepts, scaling of MOS circuits-qualitative and quantitative analysis with proper illustrations and necessary derivations of expressions.

UNIT-IV:

**Subsystem Design and Layout**: Some architectural issues, switch logic, gate logic, examples of structured design (combinational logic), some clocked sequential circuits, other system considerations.

**Subsystem Design Processes**: Some general considerations and an illustration of design processes, design of an ALU subsystem.

UNIT-V:

**Floor Planning**: Introduction, Floor planning methods, off-chip connections.

**Architecture Design**: Introduction, Register-Transfer design, high-level synthesis, architectures for low power, architecture testing.

**Chip Design**: Introduction and design methodologies.
TEXT BOOKS:


REFERENCE BOOKS:

DIGITAL DATA COMMUNICATIONS

UNIT -I:
Digital Modulation Schemes:
BPSK, QPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK – Methods, Band Width Efficiency, Carrier Recovery, Clock Recovery.

UNIT -II:
Basic Concepts of Data Communications, Interfaces and Modems:

UNIT -III:
Error Correction: Types of Errors, Vertical Redundancy Check (VRC), LRC, CRC, Checksum, Error Correction using Hamming code
Data Link Control: Line Discipline, Flow Control, Error Control

UNIT -IV:
Multiplexing: Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Multiplexing Application, DSL.
Local Area Networks: Ethernet, Other Ether Networks, Token Bus, Token Ring, FDDI.
Metropolitan Area Networks: IEEE 802.6, SMDS
Switching: Circuit Switching, Packet Switching, Message Switching.
Networking and Interfacing Devices: Repeaters, Bridges, Routers, Gateway, Other Devices.

UNIT -V:
Multiple Access Techniques:
Frequency- Division Multiple Access (FDMA), Time - Division Multiple Access (TDMA), Code - Division Multiple Access (CDMA), OFDM and OFDMA. Random Access, Aloha- Carrier Sense Multiple Access (CSMA)- Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA), Controlled Access- Reservation- Polling- Token Passing, Channelization.
TEXT BOOKS:

REFERENCE BOOKS:
1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
UNIT-I:
**Fundamentals of Computer Design:**
Fundamentals of Computer design, Changing faces of computing and task of computer designer, Technology trends, Cost price and their trends, Measuring and reporting performance, Quantitative principles of computer design, Amdahl’s law.
Instruction set principles and examples- Introduction, Classifying instruction set- MEmory addressing- type and size of operands, Operations in the instruction set.

UNIT –II:
**Pipelines:**
Introduction, Basic RISC instruction set, Simple implementation of RISC instruction set, Classic five stage pipe lined RISC processor, Basic performance issues in pipelining, Pipeline hazards, Reducing pipeline branch penalties.
**Memory Hierarchy Design:**

UNIT -III:
**Instruction Level Parallelism the Hardware Approach:**
Instruction-Level parallelism, Dynamic scheduling, Dynamic scheduling using Tomasulo’s approach, Branch prediction, high performance instruction delivery- hardware based speculation.
**ILP Software Approach**
Basic compiler level techniques, Static branch prediction, VLIW approach, Exploiting ILP, Parallelism at compile time, Cross cutting issues -Hardware verses Software.

UNIT –IV:
**Multi Processors and Thread Level Parallelism:**
Multi Processors and Thread level Parallelism- Introduction, Characteristics of application domain, Systematic shared memory architecture, Distributed shared – memory architecture, Synchronization.

UNIT –V:
**Inter Connection and Networks:**
Introduction, Interconnection network media, Practical issues in interconnecting networks, Examples of inter connection, Cluster, Designing of clusters.
**Intel Architecture:** Intel IA-64 ILP in embedded and mobile markets Fallacies and pit falls.
TEXT BOOKS:

REFERENCE BOOKS:
UNIT -I:
The Cellular Concept-System Design Fundamentals:
Introduction, Frequency Reuse, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference, Power Control for Reducing interference, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Trunking and Grade of Service

UNIT –II:
Mobile Radio Propagation: Large-Scale Path Loss:

UNIT –III:
Mobile Radio Propagation: Small–Scale Fading and Multipath
Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke’s model for flat fading, spectral shape due to Doppler spread in Clarke’s model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

UNIT -IV:
Equalization and Diversity
Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.

UNIT -V:
Wireless Networks
Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, HiperLan, WLL.

TEXT BOOKS:

REFERENCE BOOKS:
2. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
I Year I Semester

DIGITAL DESIGN USING HDL
(ELECTIVE-I)

UNIT-I:

Digital Logic Design using VHDL

Introduction, designing with VHDL, design entry methods, logic synthesis, entities, architecture, packages and configurations, types of models: dataflow, behavioral, structural, signals vs. variables, generics, data types, concurrent vs. sequential statements, loops and program controls.

Digital Logic Design using Verilog HDL

Introduction, Verilog Data types and Operators, Binary data manipulation, Combinational and Sequential logic design, Structural Models of Combinational Logic, Logic Simulation, Design Verification and Test Methodology, Propagation Delay, Truth Table models using Verilog.

UNIT-II:

Combinational Logic Circuit Design using VHDL


Sequential Logic Circuit Design using VHDL

Flip-flops, registers & counters, synchronous sequential circuits: Basic design steps, Mealy State model, Design of FSM using CAD tools, Serial Adder Example, State Minimization, Design of Counter using sequential Circuit approach.

UNIT-III: Digital Logic Circuit Design Examples using Verilog HDL

Behavioral modeling, Data types, Boolean-Equation-Based behavioral models of combinational logics, Propagation delay and continuous assignments, latches and level-sensitive circuits in Verilog, Cyclic behavioral models of flip-flops and latches and Edge detection, comparison of styles for behavioral model: Behavioral model, Multiplexers, Encoders and Decoders, Counters, Shift Registers, Register files, Dataflow models of a linear feedback shift register, Machines with multi cycle operations, ASM and ASMD charts for behavioral modeling, Design examples, Keypad scanner and encoder.

UNIT-IV: Synthesis of Digital Logic Circuit Design

Introduction to Synthesis, Synthesis of combinational logic, Synthesis of sequential logic with latches and flip-flops, Synthesis of Explicit and Implicit State Machines, Registers and counters.
UNIT-V: Testing of Digital Logic Circuits and CAD Tools

Testing of logic circuits, fault model, complexity of a test set, path-sensitization, circuits with tree structure, random tests, testing of sequential circuits, built in self test, printed circuit boards, computer aided design tools, synthesis, physical design.

TEXT BOOKS:


REFERENCE BOOKS:


TEXT BOOKS:
2. Internetworking with TCP/IP Comer 3 rd edition PHI

REFERENCE BOOKS:
SOFTWARE DEFINED RADIO
(ELECTIVE – II)

UNIT -I:
Introduction:
The Need for Software Radios, What is Software Radio, Characteristics and benefits of software radio- Design Principles of Software Radio, RF Implementation issues- The Purpose of RF Front – End, Dynamic Range- The Principal Challenge of Receiver Design – RF Receiver Front- End Topologies- Enhanced Flexibility of the RF Chain with Software Radios- Importance of the Components to Overall Performance- Transmitter Architectures and Their Issues- Noise and Distortion in the RF Chain, ADC and DAC Distortion.

UNIT -II:
Multi Rate Signal Processing:
Introduction- Sample Rate Conversion Principles- Polyphase Filters- Digital Filter Banks- Timing Recovery in Digital Receivers Using Multirate Digital Filters.
Digital Generation of Signals:

UNIT -III:
Analog to Digital and Digital to Analog Conversion:
Parameters of ideal data converters- Parameters of Practical data converters- Analog to Digital and Digital to Analog Conversion- Techniques to improve data converter performance- Common ADC and DAC architectures.

UNIT -IV:
Digital Hardware Choices:
Introduction- Key Hardware Elements- DSP Processors- Field Programmable Gate Arrays- Trade-Offs in Using DSPs, FPGAs, and ASICs- Power Management Issues- Using a Combination of DSPs, FPGAs, and ASICs.

UNIT -V:
Object – Oriented Representation of Radios and Network Resources:
Networks- Object Oriented Programming- Object Brokers- Mobile Application Environments- Joint Tactical Radio System.
TEXT BOOKS:

REFERENCE BOOKS:
UNIT -I:
Introduction:
Modern Techniques:  
Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operations.

UNIT -II:
Encryption Algorithms:

UNIT -III:
Public Key Cryptography: Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography. Number Theory: Prime and Relatively prime numbers, Modular arithmetic, Fermat’s and Euler’s theorems, Testing for primality, Euclid’s Algorithm, the Chinese remainder theorem, Discrete logarithms.

UNIT -IV:
UNIT –V:
IP Security:

Intruders, Viruses and Worms
Intruders, Viruses and Related threats.

Fire Walls: Fire wall Design Principles, Trusted systems.

TEXT BOOKS:

REFERENCE BOOKS:
1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
5. Introduction to Cryptography, Buchmann, Springer.
UNIT –I:  
**Fundamentals of Image Processing and Image Transforms:**
Introduction, Image sampling, Quantization, Resolution, Image file formats, Elements of image processing system, Applications of Digital image processing
Introduction, Need for transform, image transforms, Fourier transform, 2 D Discrete Fourier transform and its transforms, Importance of phase, Walsh transform, Hadamard transform, Haar transform, slant transform Discrete cosine transform, KL transform, singular value decomposition, Radon transform, comparison of different image transforms.

UNIT –II:  
**Image Enhancement:**
Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters.
Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.

**Image Restoration:**
Introduction to Image restoration, Image degradation, Types of image blur, Classification of image restoration techniques, Image restoration model, Linear and Nonlinear image restoration techniques, Blind deconvolution

UNIT –III:  
**Image Segmentation:**
Introduction to image segmentation, Point, Line and Edge Detection, Region based segmentation., Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding, Edge based segmentation, Edge detection and linking, Hough transform, Active contour

**Image Compression:**

UNIT -IV:  
**Basic Steps of Video Processing:**
UNIT –V:  
2-D Motion Estimation:
Optical flow, General Methodologies, Pixel Based Motion Estimation, Block- Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.

TEXT BOOKS:

REFRENCE BOOKS:
A student has to do at least 6 Experiments from each Part.

Part A:

Systems Design experiments

- The students are required to design the logic to perform the following experiments using necessary Industry standard simulator to verify the logical /functional operation, perform the analysis with appropriate synthesizer and to verify the implemented logic with different hardware modules/kits (CPLD/FPGA kits).
- Consider the suitable switching function and data to implement the required logic if required.

List of Experiments:

1. Determination of EPCs using CAMP-I Algorithm.
2. Determination of SPCs using CAMP-I Algorithm.
3. Determination of SCs using CAMP-II Algorithm.
4. PLA minimization algorithm (IISc algorithm)
5. PLA folding algorithm(COMPACT algorithm)
6. ROM design.
7. Control unit and data processor logic design
8. Digital system design using FPGA.
10. Hamming experiments.

Lab Requirements:

**Software:** Industry standard software with perpetual licence consisting of required simulator, synthesizer, analyzer etc. in an appropriate integrated environment.

**Hardware:** Personal Computer with necessary peripherals, configuration and operating System and relevant VLSI (CPLD/FPGA) hardware Kits.
Part-B:

Data Communications Experiments

1. Study of serial interface RS – 232
2. Study of pc to pc communication using parallel port
3. To establish pc-pc communication using LAN
4. Study of LAN using star topology, bus topology and tree topology
5. Study and configure modem of a computer
6. To configure a hub/switch
7. To study the interconnections of cables for data communication
8. Study of a wireless communication system

Software and Equipment required

- Data Communication Trainer kits
- Computers
- LAN Trainer kit
- ST 5001 Software/ NS2 Software
- Serial and parallel port cables
- Patch cords (2 mm), FOE/LOE Cables, Main power cords
- Ethernet Cables (CAT5, CAT5E, CAT6, CAT7)
- Hubs, Switches, MODEMs
- RS 232 DB25/DB9 Connectors
UNIT-I: Introduction
An Embedded System-Definition, Examples, Current Technologies, Integration in system Design, Embedded system design flow, hardware design concepts, software development, processor in an embedded system and other hardware units, introduction to processor based embedded system design concepts.

UNIT-II: Embedded Hardware
Embedded hardware building blocks, Embedded Processors – ISA architecture models, Internal processor design, processor performance, Board Memory – ROM, RAM, Auxiliary Memory, Memory Management of External Memory, Board Memory and performance.

Embedded board Input / output – Serial versus Parallel I/O, interfacing the I/O components, I/O components and performance, Board buses – Bus arbitration and timing, Integrating the Bus with other board components, Bus performance.

UNIT-III: Embedded Software
Device drivers, Device Drivers for interrupt-Handling, Memory device drivers, On-board bus device drivers, Board I/O drivers, Explanation about above drivers with suitable examples.

Embedded operating systems – Multitasking and process Management, Memory Management, I/O and file system management, OS standards example – POSIX, OS performance guidelines, Board support packages, Middleware and Application Software – Middleware, Middleware examples, Application layer software examples.

Embedded system design and development lifecycle model, creating an embedded system architecture, introduction to embedded software development process and tools- Host and Target machines, linking and locating software, Getting embedded software into the target system, issues in Hardware-Software design and co-design.

Implementing the design-The main software utility tool, CAD and the hardware, Translation tools, Debugging tools, testing on host machine, simulators, Laboratory tools, System Boot-Up.

UNIT-V: Embedded System Design-Case Studies
Case studies- Processor design approach of an embedded system –Power PC Processor based and Micro Blaze Processor based Embedded system design on Xilinx platform-NiosII Processor based Embedded system design on Altera platform-Respective Processor architectures should be taken into consideration while designing an Embedded System.
TEXT BOOKS:


REFERENCE BOOKS:


I Year II Semester

CMOS ANALOG AND DIGITAL IC DESIGN

UNIT-I:

MOS Devices and Modeling


MOS Design

Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT-II:

Combinational MOS Logic Circuits:

MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates, AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

Sequential MOS Logic Circuits

Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

UNIT -III:

Dynamic Logic Circuits

Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

Semiconductor Memories

Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory- NOR flash and NAND flash.
UNIT -IV:

Analog CMOS Sub-Circuits

MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-
Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current
Mirror, Current and Voltage References, Band gap Reference.

UNIT-V:

CMOS Amplifiers

Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers,
High Gain Amplifiers Architectures.

CMOS Operational Amplifiers

Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps,
Power- Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement
Techniques of OP Amp.

TEXT BOOKS:

2. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf
3. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford
4. Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis

REFERENCE BOOKS:

1. Analog Integrated Circuit Design- David A. Johns, Ken Martin, Wiley Student Edn,
   2016.
3. CMOS: Circuit Design, Layout and Simulation- Baker, Li and Boyce, PHI.
4. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, AnanthaChandrakasan,
   BorivojeNikolic, 2nd Ed., PHI.
UNIT –I: 
**Introduction to Digital Signal Processing:**
Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation.

**Computational Accuracy in DSP Implementations:**
Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT –II: 
**Architectures for Programmable DSP Devices:**
Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT –III: 
**Programmable Digital Signal Processors:**
Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline operation of TMS320C54XX Processors.

UNIT –IV: 
**Analog Devices Family of DSP Devices:**
Introduction to Blackfin Processor - The Blackfin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.

UNIT –V: 
**Interfacing Memory and I/O Peripherals to Programmable DSP Devices:**
Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).
TEXT BOOKS:

REFERENCE BOOKS:
4. Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI
I Year II Semester

SYSTEM ON CHIP DESIGN
(ELECTIVE-III)

UNIT-I: Introduction to the System Approach


UNIT-II: Processors


UNIT-III: Memory Design for SOC


UNIT-IV: Interconnect Customization and Configuration


UNIT-V: Application Studies / Case Studies

SOC Design approach, AES algorithms, Design and evaluation, Image compression – JPEG compression.

TEXT BOOKS:

REFERENCE BOOKS:
2. Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) – Jason Andrews – Newnes, BK and CDROM.
UNIT –I: Introduction:
Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, Knowledge representation - Expert systems.

UNIT –II: Artificial Neural Networks:
Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron, Learning and Training the neural network, Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.

UNIT –III: Fuzzy Logic System:
Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modeling and control schemes for nonlinear systems, Self-organizing fuzzy logic control, Fuzzy logic control for nonlinear timedelay system.

UNIT –IV: Genetic Algorithm:
Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search and and-colony search techniques for solving optimization problems.

UNIT –V: Applications:

TEXT BOOKS:
REFERENCES:

I Year II Semester

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CYBER SECURITY
(ELECTIVE – III)
EMBEDDED REAL TIME OPERATING SYSTEMS

(ELECTIVE – IV)

UNIT-I: Introduction

UNIT-II: RTOS Programming
Basic Functions and Types of RTOS for Embedded Systems, RTOS mCOS-II, RTOS Vx Works, Programming concepts of above RTOS with relevant Examples, Programming concepts of RTOS Windows CE, RTOS OSEK, RTOS Linux 2.6.x and RTOS RT Linux.

UNIT-III: Program Modeling – Case Studies
Case study of embedded system design and coding for an Automatic Chocolate Vending Machine (ACVM) Using Mucos RTOS, case study of digital camera hardware and software architecture, case study of coding for sending application layer byte streams on a TCP/IP Network Using RTOS Vx Works, Case Study of Embedded System for an Adaptive Cruise Control (ACC) System in Car, Case Study of Embedded System for a Smart Card, Case Study of Embedded System of Mobile Phone Software for Key Inputs.

UNIT-IV: Target Image Creation & Programming in Linux

Overview and programming concepts of Unix/Linux Programming, Shell Programming, System Programming.

UNIT-V: Programming in RT Linux
Overview of RT Linux, Core RT Linux API, Program to display a message periodically, semaphore management, Mutex, Management, Case Study of Appliance Control by RT Linux System.
TEXT BOOKS:

REFERENCES:
UNIT I
ISDN & B-ISDN: Overview of ISDN, ISDN channels, User access, ISDN protocols, Brief history of B-ISDN and ATM, ATM based services and applications, principles and building block of B-ISDN, general architecture of B-ISDN, frame relay.

UNIT II
ATM NETWORKS: Network layering, switching of virtual channels and virtual paths, applications of virtual channels and connections, QOS parameters, traffic descriptors, ATM service categories, ATM cell header, ATM layer, ATM adaptation layer.

UNIT III
REARRANGEABLE NETWORKS: Rearrangeable class networks, folding algorithm, bens network, looping algorithm.

UNIT IV
ATM SIGNALING, ROUTING AND TRAFFIC CONTROL: ATM addressing, UNI signalling, PNNI signalling, PNNI routing, ABR Traffic management.

UNIT V
TCP/IP NETWORKS: History of TCP/IP, TCP application and Services, Motivation, TCP, UDP, IP services and Header formats, Internetworking, TCP congestion control, Queue management: Passive & active, QOS in IP networks: differentiated and integrated services.

TEXT BOOKS:
UNIT -I:

Introduction, Natural and Nuclear Sources of EMI / EMC:

Electromagnetic environment, History, Concepts, Practical experiences and concerns, frequency spectrum conservations, An overview of EMI / EMC, Natural and Nuclear sources of EMI.

UNIT -II:

EMI from Apparatus, Circuits and Open Area Test Sites:

Electromagnetic emissions, Noise from relays and switches, Non-linearities in circuits, passive intermodulation, Cross talk in transmission lines, Transients in power supply lines, Electromagnetic interference (EMI), Open area test sites and measurements.

UNIT -III:

Radiated and Conducted Interference Measurements and ESD:

Anechoic chamber, TEM cell, GH TEM Cell, Characterization of conduction currents / voltages, Conducted EM noise on power lines, Conducted EMI from equipment, Immunity to conducted EMI detectors and measurements, ESD, Electrical fast transients / bursts, Electrical surges.

UNIT -IV:

Grounding, Shielding, Bonding and EMI filters:

Principles and types of grounding, Shielding and bonding, Characterization of filters, Power lines filter design.

UNIT -V:

Cables, Connectors, Components and EMC Standards:

EMI suppression cables, EMC connectors, EMC gaskets, Isolation transformers, optoisolators, National / International EMC standards.
TEXT BOOKS:


REFERENCE BOOKS:

EMBEDDED SYSTEMS DESIGN LABORATORY

- The Students are required to write the programs using C-Language according to the Experiment requirements using RTOS Library Functions and macros ARM-926 developer kits and ARM-Cortex.
- The following experiments are required to develop the algorithms, flow diagrams, source code and perform the compilation, execution and implement the same using necessary hardware kits for verification. The programs developed for the implementation should be at the level of an embedded system design.
- The students are required to perform at least SIX experiments from Part-I and TWO experiments from Part-II.

**List of Experiments:**

**Part-I: Experiments using ARM-926 with PERFECT RTOS**
1. Register a new command in CLI.
2. Create a new Task.
3. Interrupt handling.
4. Allocate resource using semaphores.
5. Share resource using MUTEX.
6. Avoid deadlock using BANKER’S algorithm.
7. Synchronize two identical threads using MONITOR.
8. Reader’s Writer’s Problem for concurrent Tasks.

**Part-II Experiments on ARM-CORTEX processor using any open source RTOS.**
(Coo-Cox-Software-Platform)

1. Implement the interfacing of display with the ARM-CORTEX processor.
2. Interface ADC and DAC ports with the Input and Output sensitive devices.
3. Simulate the temperature DATA Logger with the SERIAL communication with PC.
4. Implement the developer board as a modem for data communication using serial port communication between two PC’s.

**Lab Requirements:**

**Software:**

(i) Eclipse IDE for C and C++ (YAGARTO Eclipse IDE), Perfect RTOS Library, COO-COX Software Platform, YAGARTO TOOLS, and TFTP SERVER.
(ii) LINUX Environment for the compilation using Eclipse IDE & Java with latest version.
Hardware:

(i) The development kits of ARM-926 Developer Kits and ARM-Cortex Boards.

(ii) Serial Cables, Network Cables and recommended power supply for the board.
ACADEMIC REGULATIONS & COURSE STRUCTURE

For

EMBEDDED SYSTEMS
(Applicable for batches admitted from 2016-2017)
### I Semester

<table>
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<th>S. No.</th>
<th>Name of the Subject</th>
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<td>1</td>
<td>Digital System Design</td>
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<td>Embedded System Design</td>
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<td>Embedded Real Time Operating Systems</td>
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<td>2. Network Security &amp; Cryptography</td>
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<td>3. Advanced Computer Architecture</td>
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<td>Digital Signal Processors and Architecture</td>
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<td>CPLD and FPGA Architectures and Applications</td>
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<td>2. Micro Electro Mechanical System Design</td>
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<td>3. Multimedia and Signal Coding</td>
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### IV Semester

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<td>Project Work Part - II</td>
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I Year I Semester

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DIGITAL SYSTEM DESIGN

UNIT-I:  Minimization Procedures and CAMP Algorithm:

Review on minimization of switching functions using tabular methods, k-map, QM algorithm, CAMP-I algorithm, Phase-I: Determination of Adjacencies, DA, CSC, SSMs and EPCs., CAMP-I algorithm, Phase-II: Passport checking, Determination of SPC, CAMP-II algorithm: Determination of solution cube, Cube based operations, determination of selected cubes are wholly within the given switching function or not, Introduction to cube based algorithms.

UNIT-II:  PLA Design, Minimization and Folding Algorithms:

Introduction to PLDs, basic configurations and advantages of PLDs, PLA-Introduction, Block diagram of PLA, size of PLA, PLA design aspects, PLA minimization algorithm (IISc algorithm), PLA folding algorithm (COMPACT algorithm) - Illustration of algorithms with suitable examples.

UNIT -III:  Design of Large Scale Digital Systems:

Algorithmic state machinecharts-Introduction, Derivation of SM Charts, Realization of SM Chart, control implementation, control unit design, data processor design, ROM design, PAL design aspects, digital system design approaches using CPLDs, FPGAs and ASICs.

UNIT-IV:  Fault Diagnosis in Combinational Circuits:

Faults classes and models, fault diagnosis and testing, fault detection test, test generation, testing process, obtaining a minimal complete test set, circuit under test methods- Path sensitization method, Boolean difference method, properties of Boolean differences, Kohavi algorithm, faults in PLAs, DFT schemes, built in self-test.

UNIT-V:  Fault Diagnosis in Sequential Circuits:

Fault detection and location in sequential circuits, circuit test approach, initial state identification, Haming experiments, synchronizing experiments, machine identification, distinguishing experiment, adaptive distinguishing experiments.

TEXT BOOKS:

1. Logic Design Theory-N. N. Biswas, PHI
3. Digital system Design using PLDd-Lala

REFERENCE BOOKS:

EMBEDDED SYSTEM DESIGN

UNIT-I: Introduction

An Embedded System-Definition, Examples, Current Technologies, Integration in system Design, Embedded system design flow, hardware design concepts, software development, processor in an embedded system and other hardware units, introduction to processor based embedded system design concepts.

UNIT-II: Embedded Hardware

Embedded hardware building blocks, Embedded Processors – ISA architecture models, Internal processor design, processor performance, Board Memory – ROM, RAM, Auxiliary Memory, Memory Management of External Memory, Board Memory and performance.

Embedded board Input / output – Serial versus Parallel I/O, interfacing the I/O components, I/O components and performance, Board buses – Bus arbitration and timing, Integrating the Bus with other board components, Bus performance.

UNIT-III: Embedded Software

Device drivers, Device Drivers for interrupt-Handling, Memory device drivers, On-board bus device drivers, Board I/O drivers, Explanation about above drivers with suitable examples.

Embedded operating systems – Multitasking and process Management, Memory Management, I/O and file system management, OS standards example – POSIX, OS performance guidelines, Board support packages, Middleware and Application Software – Middleware, Middleware examples, Application layer software examples.


Embedded system design and development lifecycle model, creating an embedded system architecture, introduction to embedded software development process and tools- Host and Target machines, linking and locating software, Getting embedded software into the target system, issues in Hardware-Software design and co-design.

Implementing the design-The main software utility tool, CAD and the hardware, Translation tools, Debugging tools, testing on host machine, simulators, Laboratory tools, System Boot-Up.
UNIT-V: Embedded System Design-Case Studies

Case studies- Processor design approach of an embedded system –Power PC Processor based and Micro Blaze Processor based Embedded system design on Xilinx platform-NiosII Processor based Embedded system design on Altera platform-Respective Processor architectures should be taken into consideration while designing an Embedded System.

TEXT BOOKS:


REFERENCE BOOKS:


UNIT-I: Introduction


UNIT-II: RTOS Programming

Basic Functions and Types of RTOS for Embedded Systems, RTOS mCOS-II, RTOS Vx Works, Programming concepts of above RTOS with relevant Examples, Programming concepts of RTOS Windows CE, RTOS OSEK, RTOS Linux 2.6.x and RTOS RT Linux.

UNIT-III: Program Modeling – Case Studies

Case study of embedded system design and coding for an Automatic Chocolate Vending Machine (ACVM) Using Mucos RTOS, case study of digital camera hardware and software architecture, case study of coding for sending application layer byte streams on a TCP/IP Network Using RTOS Vx Works, Case Study of Embedded System for an Adaptive Cruise Control (ACC) System in Car, Case Study of Embedded System for a Smart Card, Case Study of Embedded System of Mobile Phone Software for Key Inputs.

UNIT-IV: Target Image Creation & Programming in Linux


Overview and programming concepts of Unix/Linux Programming, Shell Programming, System Programming.

UNIT-V: Programming in RT Linux

Overview of RT Linux, Core RT Linux API, Program to display a message periodically, semaphore management, Mutex, Management, Case Study of Appliance Control by RT Linux System.

TEXT BOOKS:

REFERENCES:

I Year I Semester

EMBEDDED C

UNIT-I:  Programming Embedded Systems in C

Introduction, What is an embedded system, Which processor should you use, Which programming language should you use, Which operating system should you use, How do you develop embedded software, Conclusions

Introducing the 8051 Microcontroller Family

Introduction, What’s in a name, The external interface of the Standard 8051, Reset requirements, Clock frequency and performance, Memory issues, I/O pins, Timers, Interrupts, Serial interface, Power consumption, Conclusions

UNIT-II:  Reading Switches

Introduction, Basic techniques for reading from port pins, Example: Reading and writing bytes, Example: Reading and writing bits (simple version), Example: Reading and writing bits (generic version), The need for pull-up resistors, Dealing with switch bounce, Example: Reading switch inputs (basic code), Example: Counting goats, Conclusions

UNIT-III:  Adding Structure to the Code

Introduction, Object-oriented programming with C, The Project Header (MAIN.H), The Port Header (PORT.H), Example: Restructuring the ‘Hello Embedded World’ example, Example: Restructuring the goat-counting example, Further examples, Conclusions

UNIT-IV:  Meeting Real-Time Constraints

Introduction, Creating ‘hardware delays’ using Timer 0 and Timer 1, Example: Generating a precise 50 ms delay, Example: Creating a portable hardware delay, Why not use Timer 2?, The need for ‘timeout’ mechanisms, Creating loop timeouts, Example: Testing loop timeouts, Example: A more reliable switch interface, Creating hardware timeouts, Example: Testing a hardware timeout, Conclusions

UNIT-V:  Case Study-Intruder Alarm System

Introduction, The software architecture, Key software components used in this example, running the program, the software, Conclusions
TEXT BOOKS:


REFERENCE BOOKS:

1. PICMCU C-An introduction to programming, The Microchip PIC in CCS C - Nigel Gardner.
I Year I Semester

SENSORS AND ACTUATORS
(ELECTIVE-I)

UNIT-I:


UNIT-II:


UNIT-III:


UNIT - IV:


UNIT-V: Actuators

Pneumatic and Hydraulic Actuation Systems- Actuation systems – Pneumatic and hydraulic systems - Directional Control valves – Pressure control valves – Cylinders - Servo and proportional control valves – Process control valves – Rotary actuators

Mechanical Actuation Systems- Types of motion – Kinematic chains – Cams – Gears – Ratchet and pawl – Belt and chain drives – Bearings – Mechanical aspects of motor selection


TEXT BOOKS:


REFERENCE BOOKS:

UNIT-I: Introduction

UNIT-II:
Modern Techniques:
Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operations.

Algorithms:

Conventional Encryption:
Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation.

Public Key Cryptography:
Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography.

UNIT-III:
Number Theory:
Prime and Relatively prime numbers, Modular arithmetic, Fermat’s and Euler’s theorems, Testing for primality, Euclid’s Algorithm, the Chinese remainder theorem, Discrete logarithms.

Message authentication and Hash Functions:
Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.
UNIT-IV:
Hash and Mac Algorithms: MD File, Message digest Algorithm, Secure Hash Algorithm, RIPEMD-160, HMAC.


UNIT-V:


Intruders, Viruses and Worms: Intruders, Viruses and Related threats.

Fire Walls:Fire wall Design Principles, Trusted systems.

TEXT BOOKS:

REFERENCE BOOKS:
1. Principles of Network and Systems Administration, Mark Burgess, JohnWiy.
ADVANCED COMPUTER ARCHITECTURE
(ELECTIVE-I)

UNIT-I: Fundamentals of Computer Design:

Fundamentals of Computer design, Changing faces of computing and task of computer designer, Technology trends, Cost price and their trends, measuring and reporting performance, Quantitative principles of computer design, Amdahl’s law.

Instruction set principles and examples- Introduction, classifying instruction set- memory addressing- type and size of operands, Operations in the instruction set.

UNIT-II:

Pipelines:

Introduction, basic RISC instruction set, Simple implementation of RISC instruction set, Classic five stage pipe lined RISC processor, Basic performance issues in pipelining, Pipeline hazards, Reducing pipeline branch penalties.

Memory Hierarchy Design:


UNIT-III:

Instruction Level Parallelism (ILP)-The Hardware Approach:

Instruction-Level parallelism, Dynamic scheduling, Dynamic scheduling using Tomasulo’s approach, Branch prediction, High performance instruction delivery- Hardware based speculation.

ILP Software Approach:

Basic compiler level techniques, Static branch prediction, VLIW approach, Exploiting ILP, Parallelism at compile time, Cross cutting issues - Hardware verses Software.

UNIT-IV: Multi Processors and Thread Level Parallelism:

Multi Processors and Thread level Parallelism- Introduction, Characteristics of application domain, Systematic shared memory architecture, Distributed shared – Memory architecture, Synchronization.
UNIT-V:

Inter Connection and Networks:

Introduction, Interconnection network media, Practical issues in interconnecting networks, Examples of inter connection, Cluster, Designing of clusters.

Intel Architecture: Intel IA-64 ILP in embedded and mobile markets Fallacies and pit falls.

TEXT BOOKS:


REFERENCE BOOKS:

I Year I Semester

EMBEDDED COMPUTING
(ELECTIVE-II)

UNIT-I:

Programming on Linux Platform:
System Calls, Scheduling, Memory Allocation, Timers, Embedded Linux, Root File System, Busy Box.

UNIT-II: Introduction to Software Development Tools
GNU GCC, make, gdb, static and dynamic linking, C libraries, compiler options, code optimization switches, lint, code profiling tools.

UNIT-III: Interfacing Modules
Sensor and actuator interface, data transfer and control, GPS, GSM module interfacing with data processing and display, OpenCV for machine vision, Audio signal processing.

UNIT-IV: Networking Basics
Sockets, ports, UDP, TCP/IP, client server model, socket programming, 802.11, Bluetooth, ZigBee, SSH, firewalls, network security.

UNIT-V: Intel Architecture 32-bit (IA32) Instruction Set
Application binary interface, exception and interrupt handling, interrupt latency, assemblers, assembler directives, macros, simulation and debugging tools.

TEXT BOOKS:
3. Assembly Language for x86 Processors by Kip R. Irvine
REFERENCE BOOKS:

2. Intel® 64 and IA-32 Architectures Software Developer Manuals
3. The Design of the UNIX Operating System by Maurice J. Bach Prentice-Hall
UNIT –I:

Introduction:

Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, Knowledge representation - Expert systems.

UNIT –II:

Artificial Neural Networks:

Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron, Learning and Training the neural network, Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.

UNIT –III:

Fuzzy Logic System:

Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modeling and control schemes for nonlinear systems, Self-organizing fuzzy logic control, Fuzzy logic control for nonlinear timedelay system.

UNIT –IV:

Genetic Algorithm:

Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search and and-colony search techniques for solving optimization problems.

UNIT –V:

Applications:

TEXT BOOKS:


REFERENCE BOOKS:

UNIT-I: Introduction to Operating Systems:
Overview of computer system hardware, Instruction execution, I/O function, Interrupts, Memory hierarchy, I/O Communication techniques, Operating system objectives and functions, Evaluation of operating System

UNIT-II: Introduction to UNIX and LINUX:
Basic Commands & Command Arguments, Standard Input, Output, Input / Output Redirection, Filters and Editors, Shells and Operations

UNIT-III:
System Calls:
System calls and related file structures, Input / Output, Process creation & termination.

Inter Process Communication:
Introduction, File and record locking, Client – Server example, Pipes, FIFOs, Streams & Messages, Name Spaces, Systems V IPC, Message queues, Semaphores, Shared Memory, Sockets & TLI.

UNIT-IV:
Introduction to Distributed Systems:
Goals of distributed system, Hardware and software concepts, Design issues.

Communication in Distributed Systems:
Layered protocols, ATM networks, Client - Server model, Remote procedure call and Group communication.

UNIT-V:
Synchronization in Distributed Systems:
Clock synchronization, Mutual exclusion, E-tech algorithms, Bully algorithm, Ring algorithm, Atomic transactions

Deadlocks:
Dead lock in distributed systems, Distributed dead lock prevention and distributed dead lock detection.
TEXT BOOKS:

1. The Design of the UNIX Operating Systems – Maurice J. Bach, 1986, PHI.
2. Distributed Operating System - Andrew. S. Tanenbaum, 1994, PHI.

REFERENCE BOOKS:

EMBEDDED C LABORATORY

- The Students are required to write the programs using C-Language according to the hardware requirements such as 8051/PIC Micro controllers or any ARM processor developer kits.
- The following experiments are required to develop the algorithms, flow diagrams, source code and perform the compilation, execution and implement the same using necessary hardware kits for verification. The programs developed for the implementation should be at the level of an embedded system design.
- The students are required to perform at least EIGHT experiments.

**List of Experiments:**

1. LED Blinking.
2. ASCII to Decimal vice versa conversion.
3. Basic Arithmetic operations.
4. PWM(Motor application).
5. Serial Communication(USART).
6. ADC and DAC implementation.
7. JTAG Debugger.
8. Seven segment display interfacing.
9. LCD display interfacing.
10. 3x4 keyboard interfacing.
11. Memory Device interfacing (Reading or Writing a file from external memory).
12. Temperature sensor/4 way Road control /Elevator.
**Lab Requirements:**

**Software:**

(i) Keil Micro-vision IDE or Eclipse IDE for C and C++ (YAGARTO Eclipse IDE)

(ii) LINUX Environment for the compilation using Eclipse IDE & Java with latest version.

**Hardware:** The development kits of 8051/PIC Micro controllers or any ARM processor.
UNIT-I:
Co-Design Issues:
Co-Design Models, Architectures, Languages, A Generic Co-design Methodology.

Co-Synthesis Algorithms:
Hardware software synthesis algorithms: hardware – software partitioning distributed system co-synthesis.

UNIT-II:
Prototyping and Emulation:
Prototyping and emulation techniques, prototyping and emulation environments, future developments in emulation and prototyping architecture specialization techniques, system communication infrastructure.

Target Architectures:
Architecture Specialization techniques, System Communication infrastructure, Target Architecture and Application System classes, Architecture for control dominated systems (8051-Architectures for High performance control), Architecture for Data dominated systems (ADSP21060, TMS320C60), Mixed Systems.

UNIT-III:
Compilation Techniques and Tools for Embedded Processor Architectures:
Modern embedded architectures, embedded software development needs, compilation technologies, practical consideration in a compiler development environment.

UNIT-IV:
Design Specification and Verification:
Design, co-design, the co-design computational model, concurrency coordinating concurrent computations, interfacing components, design verification, implementation verification, verification tools, interface verification.
UNIT-V:

Languages for System – Level Specification and Design-I:

System-level specification, design representation for system level synthesis, system level specification languages.

Languages for System – Level Specification and Design-II:

Heterogeneous specifications and multi language co-simulation, the cosyma system and lycos system.

TEXT BOOKS:


REFERENCE BOOKS:

UNIT-I:

Introduction to Digital Signal Processing
Introduction, a Digital signal-processing system, the sampling process, discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation.

Computational Accuracy in DSP Implementations
Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT-II:

Architectures for Programmable DSP Devices
Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT-III:

Programmable Digital Signal Processors
Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX Instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX Processors, Pipeline Operation of TMS320C54XX Processors.

UNIT-IV:

Analog Devices Family of DSP Devices

Introduction to Black fin Processor - The Black fin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.
UNIT-V:

Interfacing Memory and I/O Peripherals to Programmable DSP Devices

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

TEXT BOOKS:


REFERENCE BOOKS:

3. Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI
I Year II Semester

EMBEDDED NETWORKING

UNIT-I: Embedded Communication Protocols:

UNIT-II: USB and CAN Bus:

UNIT-III: Ethernet Basics:

UNIT-IV: Embedded Ethernet:

UNIT-V: Wireless Embedded Networking:

TEXT BOOKS:

REFERENCE BOOKS:
1. Advanced PIC microcontroller projects in C: from USB to RTOS with the PIC18F series - Dogan Ibrahim, Elsevier 2008.

*****
I Year II Semester

CPLD AND FPGA ARCHITECTURES AND APPLICATIONS

UNIT-I: Introduction to Programmable Logic Devices


UNIT-II: Field Programmable Gate Arrays

Organization of FPGAs, FPGA Programming Technologies, Programmable Logic Block Architectures, Programmable Interconnects, Programmable I/O blocks in FPGAs, Dedicated Specialized Components of FPGAs, Applications of FPGAs.

UNIT-III: SRAM Programmable FPGAs


UNIT-IV: Anti-Fuse Programmed FPGAs

Introduction, Programming Technology, Device Architecture, The Actel ACT1, ACT2 and ACT3 Architectures.

UNIT-V: Design Applications

General Design Issues, Counter Examples, A Fast Video Controller, A Position Tracker for a Robot Manipulator, A Fast DMA Controller, Designing Counters with ACT devices, Designing Adders and Accumulators with the ACT Architecture.

TEXT BOOKS:

REFERENCE BOOKS:

1. Field Programmable Gate Arrays - John V. Oldfield, Richard C. Dorf, Wiley India.
CMOS MIXED SIGNAL CIRCUIT DESIGN

(ELECTIVE – III)
UNIT-I: Introduction

Basic structures of MEM devices – (Canti-Levers, Fixed Beams diaphragms). Broad Response of Micro electromechanical systems (MEMS) to Mechanical (Force, pressure etc.) Thermal, Electrical, optical and magnetic stimuli, compatibility of MEMS from the point of power dissipation, leakage etc.

UNIT-II: Review

Review of mechanical concepts like stress, strain, bending moment, deflection curve. Differential equations describing the deflection under concentrated force, Distributed force, distributed force, Deflection curves for canti-levers- fixed beam. Electrostatic excitation – Columbic force between the fixed and moving electrodes. Deflection with voltage in C.L, Deflection Vs Voltage curve, critical fringe field – field calculations using Laplace equation. Discussion on the approximate solutions – Transient response of the MEMS.

UNIT-III: Types

Two terminal MEMS - capacitance Vs voltage Curve – Variable capacitor. Applications of variable capacitors. Two terminal MEM structures. Three terminal MEM structures – Controlled variable capacitors – MEM as a switch and possible applications.

UNIT-IV: MEM Circuits & Structures

MEM circuits & structures for simple GATES- AND, OR, NAND, NOR, Exclusive OR, simple MEM configurations for flip-flops triggering applications to counters, converters. Applications for analog circuits like frequency converters, wave shaping. RF Switches for modulation. MEM Transducers for pressure, force temperature. Optical MEMS.

UNIT-V: MEM Technologies

Silicon based MEMS- Process flow – Brief account of various processes and layers like fixed layer, moving layers spacers etc., and etching technologies.

Metal Based MEMS: Thin and thick film technologies for MEMS. Process flow and description of the processes, Status of MEMS in the current electronics scenario.
TEXT BOOKS:


REFERENCE BOOKS:

INTERNET PROTOCOLS
(ELECTIVE III)

UNIT -I:
Internetworking Concepts:

IP Address:
Classful Addressing: Introduction, Classful Addressing, Other Issues, Sub-netting and Super-netting
Classless Addressing: Variable length Blocks, Sub-netting, Address Allocation, Delivery, Forwarding, and Routing of IP Packets: Delivery, Forwarding, Routing, Structure of Router.
ARP and RARP: ARP, ARP Package, RARP.

UNIT -II:
Mobile IP: Addressing, Agents, Three Phases, Inefficiency in Mobile IP.

UNIT -III:
Unicast Routing Protocols (RIP, OSPF, and BGP): Intra and Inter-domain Routing, Distance Vector Routing, RIP, Link State Routing, OSPF, Path Vector Routing, BGP.
Multicasting and Multicast Routing Protocols: Unicast - Multicast- Broadcast, Multicast Applications, Multicast Routing, Multicast Link State Routing: MOSPF, Multicast Distance Vector: DVMRP.

UNIT -IV:
Domain Name System (DNS): Name Space, Domain Name Space, Distribution of Name Space, and DNS in the internet.
Remote Login TELNET: Concept, Network Virtual Terminal (NVT).
Electronic Mail: SMTP and POP.
UNIT -V:
Multimedia:

TEXT BOOKS:
2. Internetworking with TCP/IP Comer 3 rd edition PHI

REFERENCE BOOKS:
UNIT-I: Introduction to the System Approach:

UNIT-II: Processors:

UNIT-III: Memory Design for SOC:

UNIT-IV: Interconnect Customization and Configuration:

UNIT-V: Application Studies / Case Studies:
SOC Design approach, AES algorithms, Design and evaluation, Image compression – JPEG compression.

TEXT BOOKS:
REFERENCE BOOKS:

2. Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) – Jason Andrews – Newnes, BK and CDROM.


UNIT-II: Wireless LANs

Introduction, importance of Wireless LANs, WLAN Topologies, Transmission Techniques: Wired Networks, Wireless Networks, comparison of wired and Wireless LANs; WLAN Technologies: Infrared technology, UHF narrowband technology, Spread Spectrum technology

UNIT-III: The IEEE 802.11 Standard for Wireless LANs

Network Architecture, Physical layer, The Medium Access Control Layer; MAC Layer issues: Hidden Terminal Problem, Reliability, Collision avoidance, Congestion avoidance, Congestion control, Security, The IEEE 802.11e MAC protocol

UNIT-IV: Wireless PANs

Introduction, importance of Wireless PANs, The Bluetooth technology: history and applications, technical overview, the Bluetooth specifications, piconet synchronization and Bluetooth clocks, Master-Slave Switch; Bluetooth security; Enhancements to Bluetooth: Bluetooth interference issues, Intra and Inter Piconet scheduling, Bridge selection, Traffic Engineering, QoS and Dynamics Slot Assignment, Scatternet formation.

UNIT-V: The IEEE 802.15 working Group for WPANs

The IEEE 802.15.3, The IEEE 802.15.4, ZigBee Technology, ZigBee components and network topologies, The IEEE 802.15.4 LR-WPAN Device architecture: Physical Layer, Data Link Layer, The Network Layer, Applications; IEEE 802.15.3a Ultra wideband.
TEXT BOOKS:


REFERENCE BOOKS:


UNIT-I:


UNIT-II:
**Video Concepts:** Types of Video Signals, Analog Video, Digital Video.

**Audio Concepts:** Digitization of Sound, Quantization and Transmission of Audio.

UNIT-III:
**Compression Algorithms:**

**Lossless Compression Algorithms:** Run Length Coding, Variable Length Coding, Arithmetic Coding, Lossless JPEG, Image Compression.

**Lossy Image Compression Algorithms:** Transform Coding: KLT And DCT Coding, Wavelet Based Coding.

**Image Compression Standards:** JPEG and JPEG2000.

UNIT-IV:
**Video Compression Techniques:** Introduction to Video Compression, Video Compression Based on Motion Compensation, Search for Motion Vectors, H.261- Intra-Frame and Inter-Frame Coding, Quantization, Encoder and Decoder, Overview of MPEG1 and MPEG2.

UNIT-V:

TEXT BOOKS:
REFERENCE BOOKS:
I Year II Semester

EMBEDDED SYSTEM DESIGN LABORATORY

- The Students are required to write the programs using C-Language according to the Experiment requirements using RTOS Library Functions and macros ARM-926 developer kits and ARM-Cortex.

- The following experiments are required to develop the algorithms, flow diagrams, source code and perform the compilation, execution and implement the same using necessary hardware kits for verification. The programs developed for the implementation should be at the level of an embedded system design.

- The students are required to perform at least SIX experiments from Part-I and TWO experiments from Part-II.

List of Experiments:

Part-I: Experiments using ARM-926 with PERFECT RTOS

1. Register a new command in CLI.
2. Create a new Task.
3. Interrupt handling.
4. Allocate resource using semaphores.
5. Share resource using MUTEX.
6. Avoid deadlock using BANKER’S algorithm.
7. Synchronize two identical threads using MONITOR.
8. Reader’s Writer’s Problem for concurrent Tasks.

Part-II Experiments on ARM-CORTEX processor using any open source RTOS.

(Coo-Cox-Software-Platform)

1. Implement the interfacing of display with the ARM- CORTEX processor.
2. Interface ADC and DAC ports with the Input and Output sensitive devices.
3. Simulate the temperature DATA Logger with the SERIAL communication with PC.
4. Implement the developer board as a modem for data communication using serial port communication between two PC’s.
Lab Requirements:

Software:

(iii) Eclipse IDE for C and C++ (YAGARTO Eclipse IDE), Perfect RTOS Library, COO-COX Software Platform, YAGARTO TOOLS, and TFTP SERVER. (iv) LINUX Environment for the compilation using Eclipse IDE & Java with latest version.

Hardware:

(iii) The development kits of ARM-926 Developer Kits and ARM-Cortex Boards.
(iv) Serial Cables, Network Cables and recommended power supply for the board.
ACADEMIC REGULATIONS & COURSE STRUCTURE

For

I&CS

(Applicable for batches admitted from 2016-2017)
### I Semester

<table>
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**Total Credits**: 20

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**Total Credits**: 20
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TRANSUCERS AND SENSORS

Unit – 1
Introduction: functional elements of an instrument, Generalized performance characteristics of instruments – static characteristics, dynamic characteristics.
Zero order, first order, second order instruments – step response, ramp response and impulse response. Response of general form of instruments to periodic input and to transient input Experimental determination of measurement system parameters, loading effects under dynamic conditions.

Unit – 2
Transducers for motion and dimensional measurements: Relative displacement, translation and rotational resistive potentiometers, resistance strain gauges, LVDT, synchros, capacitance pickups. Piezo-electric transducers, electro-optical devices, nozzle – flapper transducers, digital displacement transducers, ultrasonic transducers.
Magnetic and photoelectric pulse counting methods, relative acceleration measurements, seismic acceleration pickups, calibration of vibration pickups. Gyroscopic sensors.

Unit – 3
TRANSUCERS FOR FORCE MEASUREMENT: Bonded strain gauge transducers, photoelectric transducers, variable reluctance pickup, torque measurement dynamometers.
TRANSUCERS FOR FLOW MEASUREMENT: Hot wire and hot-film anemometers, electromagnetic flow meters, laser doppler velocimeter.
TRANSUCERS FOR PRESSURE MEASUREMENT: Manometers, elastic transducers, liquid systems, gas systems, very high pressure transducers. Thermal conductivity gauges, ionisation gauges, microphone.

Unit – 4
Unit –5

**Smart sensors:** Introduction, primary sensors, converters, compensation. Recent trends in sensor technology – film sensors, semi conductor IC technology, MEMS, Nano-sensors.

**Text Book:**

**Reference:**
1. Instrumentation Measurement & Analysis, by B.C. Nakra, K.K. Choudry, (TMH)
2. Transducers and Instrumentation, by D.V.S. Murthy (PHI)
DIGITAL CONTROL SYSTEMS

UNIT –I:
Sampling and Reconstruction:
Introduction, sample and hold operations, Sampling theorem, Reconstruction of original sampled signal to continuous-time signal.

The Z – Transforms:

Z-Plane Analysis of Discrete-Time Control System:
Z-Transform method for solving difference equations; Pulse transforms function, block diagram analysis of sampled – data systems, mapping between s-plane and z-plane: Primary strips and Complementary Strips.

UNIT –II:
State Space Analysis:
State Space Representation of discrete time systems, Pulse Transfer Function Matrix solving discrete time state space equations, State transition matrix and its Properties, Methods for Computation of State Transition Matrix, Discretization of continuous time state – space equations

UNIT –III:
Controllability and Observability:
Concepts of Controllability and Observability, Tests for controllability and Observability, Duality between Controllability and Observability, Controllability and Observability conditions for Pulse Transfer Function.

Stability Analysis:
UNIT –IV:
**Design of Discrete Time Control System by Conventional Methods:**

UNIT –V:

**State Feedback Controllers and Observers:**

Design of state feedback controller through pole placement – Necessary and sufficient conditions, Ackerman’s formula, State Observers – Full order and Reduced order observers.

Introduction to Kalman filters, State estimation through Kalman filters, introduction to adaptive controls.

**TEXT BOOKS:**

1. K. Ogata - “Discrete-Time Control systems” - Pearson Education/PHI, 2\textsuperscript{nd} Edition.

2. M. Gopal - “Digital Control and State Variable Methods”- TMH

**REFERENCE BOOKS:**

2. M. Gopal - “Digital Control Engineering”.
I Year I Semester

FIBRE OPTIC SENSORS AND DEVICES

Unit –1

Unit – 2
Optical Fiber Sensors and Devices: Overview of fibre optic sensors - advantages over conventional sensors, broadband classification.


Unit – 3
Interferometric Optical Fibre Sensors: Introduction, basic principles of interferometric optical fibre sensors, components and applications of interferometric sensors.

Fused Single Mode Optical Fibre Couplers: Introduction, physical principles(coupling coefficient) polarization effect, experimental properties, theoretical modelling, and comparison with experiment.

Unit-4
Single Mode All Fibre Components: Introduction, directional couplers, polarizes, polarization splitters polarization controllers, optical isolators, single mode fibre filters wave length multiplexers and demultiplexers, switches and intensity modulators, phase and frequency modulators.

Fibre Optic Sensor Multiplexing: Introduction, general topological configuration, and incoherent and coherent detection.

Unit – 5

Text Books:

Reference:
Optical Fiber Communications and Sensors – Dr. M. Arumugam.
UNIT-I: Minimization Procedures and CAMP Algorithm:

Review on minimization of switching functions using tabular methods, k-map, QM algorithm, CAMP-I algorithm, Phase-I: Determination of Adjacencies, DA, CSC, SSMs and EPCs., CAMP-I algorithm, Phase-II: Passport checking, Determination of SPC, CAMP-II algorithm: Determination of solution cube, Cube based operations, determination of selected cubes are wholly within the given switching function or not, Introduction to cube based algorithms.

UNIT-II: PLA Design, Minimization and Folding Algorithms:

Introduction to PLDs, basic configurations and advantages of PLDs, PLA-Introduction, Block diagram of PLA, size of PLA, PLA design aspects, PLA minimization algorithm(IISc algorithm), PLA folding algorithm(COMPACT algorithm)-Illustration of algorithms with suitable examples.

UNIT-III: Design of Large Scale Digital Systems:

Algorithmic state machine charts-Introduction, Derivation of SM Charts, Realization of SM Chart, control implementation, control unit design, data processor design, ROM design, PAL design aspects, digital system design approaches using CPLDs, FPGAs and ASICs.

UNIT-IV: Fault Diagnosis in Combinational Circuits:

Faults classes and models, fault diagnosis and testing, fault detection test, test generation, testing process, obtaining a minimal complete test set, circuit under test methods- Path sensitization method, Boolean difference method, properties of Boolean differences, Kohavi algorithm, faults in PLAs, DFT schemes, built in self-test.

UNIT-V: Fault Diagnosis in Sequential Circuits:

Fault detection and location in sequential circuits, circuit test approach, initial state identification, Haming experiments, synchronizing experiments, machine identification, distinguishing experiment, adaptive distinguishing experiments.

TEXT BOOKS:

1. Logic Design Theory-N. N. Biswas, PHI
3. Digital system Design using PLDd-Lala

REFERENCE BOOKS:

ADAPTIVE CONTROL SYSTEMS
( ELECTIVE-I)

Unit-1.
Introduction: Definitions, History of adaptive Control, Essential aspects of adaptive control, Classification of adaptive control system: Feedback adaptive controllers, Feed forward adaptive controllers, Why adaptive control?

Unit-2:
Model Reference Adaptive System: Different configuration of model reference adaptive systems; classification of MRAS, Mathematical description, and Equivalent representation as a nonlinear time-varying system, direct and indirect MRAS.

Unit-3.

Unit-4:
Self Tuning Regulators: Introduction: The basic idea; process models, disturbance models, General linear difference equation models, model simplification, Different approaches to self-tuning, Recursive Parameter Estimation Methods: The RLS method, extended Least squares, Recursive instrumental variable method; U-D factorization, Covariance resulting, variable data forgetting, Estimation accuracy, Direct and Indirect Self-tuning regulators, Clarke and Gawthrop's Self tuning Controller, Pole Placement approach to self tuning control; Connection between MRAS and STR.

Unit 5:
Gain Scheduling: Introduction, The Principal, Design of Gain Scheduling Regulators, Nonlinear transformations, Applications of gain scheduling.
Alternatives to Adaptive Control: Why not Adaptive Control? Robust High gain feedback control, Variable Structure schemes, Practical aspects, application and Perspectives on adaptive control.
References Books
5. K. S. Narendra and A. M. Annaswamy, Stable Adaptive Systems
I Year I Semester

SOFT COMPUTING TECHNIQUES

(ELECTIVE -I)

UNIT –I:

Introduction:

Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, Knowledge representation - Expert systems.

UNIT –II:

Artificial Neural Networks:

Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron, Learning and Training the neural network, Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.

UNIT –III:

Fuzzy Logic System:

Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modeling and control schemes for nonlinear systems, Self-organizing fuzzy logic control, Fuzzy logic control for nonlinear time delay system.

UNIT –IV:

Genetic Algorithm:

Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search and anD-colony search techniques for solving optimization problems.

UNIT –V:

Applications:

TEXT BOOKS:


REFERENCE BOOKS:

I Year I Semester

L P C
4 0 3

CYBER SECURITY
(ELECTIVE – I)
OBJECT ORIENTED PROGRAMMING
(ELECTIVE-I)

Objective: Implementing programs for user interface and application development using core java principles

UNIT I:
Objective: Focus on object oriented concepts and java program structure and its installation

Introduction to OOP
Introduction, Need of Object Oriented Programming, Principles of Object Oriented Languages, Procedural languages Vs OOP, Applications of OOP, History of JAVA, Java Virtual Machine, Java Features, Installation of JDK1.6

UNIT II:
Objective: Comprehension of java programming constructs, control structures in Java

Programming Constructs
Variables , Primitive Datatypes, Identifiers- Naming Conventions, Keywords, Literals, Operators- Binary,Unary and ternary, Expressions, Precedence rules and Associativity, Primitive Type Conversion and Casting, Flow of control-Branching,Conditional, loops.,

Classes and Objects- classes, Objects, Creating Objects, Methods, constructors-Constructor overloading, Garbage collector, Class variable and Methods-Static keyword, this keyword, Arrays, Command line arguments

UNIT III:
Objective: Implementing Object oriented constructs such as various class hierarchies, interfaces and exception handling

Inheritance: Types of Inheritance, Deriving classes using extends keyword, Method overloading, super keyword, final keyword, Abstract class

Interfaces, Packages and Enumeration: Interface-Extending interface, Interface Vs Abstract classes, Packages-Creating packages , using Packages, Access protection, java.lang package

Exceptions & Assertions - Introduction, Exception handling techniques-try...catch, throw, throws, finally block, user defined exception, Assertions

UNIT IV:
Objective: Understanding of Thread concepts and I/O in Java

MultiThreading :java.lang.Thread, The main Thread, Creation of new threads, Thread priority, Multithreading, Synchronization, suspending and Resuming threads, Communication between Threads

Input/Output: reading and writing data, java.io package
UNIT V:
Objective: Being able to build dynamic user interfaces using applets and Event handling in java

Applets- Applet class, Applet structure, An Example Applet Program, Applet Life Cycle, paint(),update() and repaint()
Event Handling -Introduction, Event Delegation Model, java.awt.event Description, Event Listeners, Adapter classes, Inner classes

UNIT VI:
Objective: Understanding of various components of Java AWT and Swing and writing code snippets using them

Abstract Window Toolkit
Why AWT?, java.awt package, Components and Containers, Button, Label, Checkbox, Radio buttons, List boxes, Choice boxes, Text field and Text area, container classes, Layouts, Menu, Scroll bar
Swing:
Introduction , JFrame, JApplet, JPanel, Components in swings, Layout Managers, JList and JScrollBar, Split Pane, JTabbedPane, Dialog Box

Text Books:
1. The Complete Refernce Java, 8ed, Herbert Schildt, TMH
3. JAVA for Beginners, 4e, Joyce Farrell, Ankit R. Bhavsar, Cengage Learning.
4. Object oriented programming with JAVA, Essentials and Applications, Raj Kumar Bhuyya, Selvi, Chu TMH
5. Introduction to Java roogramming, 7thed, Y Daniel Liang, Pearson

Reference Books:
1. JAVA Programming, K.Rajkumar.Pearson
2. Core JAVA, Black Book, NageswaraRao, Wiley, Dream Tech
3. Core JAVA for Beginners, RashmiKanta Das, Vikas.
Unit -I

Unit -II

Unit -III

Unit -IV
Fuzzy knowledge based controllers (FKBC) design parameters: Introduction, Structure of a FKBC, Fuzzification and defuzzification module, Rule base, Choice of variable and contents of rules, derivation of rules, data base, choice of membership function and scaling factors, choice of fuzzification and defuzzification procedure, various methods.

Unit -V
Reference Books

1. D. Drainkov, H. Hellendoorn and M. Reinfrank, An Introduction to Fuzzy Control,
   Publishers limited, New Delhi, 1996.
UNIT-I:

**VLSI Technology:** Fundamentals and applications, IC production process, semiconductor processes, design rules and process parameters, layout techniques and process parameters.

**VLSI Design:** Electronic design automation concept, ASIC and FPGA design flows, SOC designs, design technologies: combinational design techniques, sequential design techniques, state machine logic design techniques and design issues.

UNIT-II:

**CMOS VLSI Design:** MOSTechnology and fabrication process of pMOS, nMOS, CMOS and BiCMOS technologies, comparison of different processes.

**Building Blocks of a VLSI circuit:** Computer architecture, memory architectures, communication interfaces, mixed signal interfaces.

**VLSI Design Issues:** Design process, design for testability, technology options, power calculations, package selection, clock mechanisms, mixed signal design.

UNIT-III:

Basic electrical properties of MOS and BiCMOS circuits, MOS and BiCMOS circuit design processes, Basic circuit concepts, scaling of MOS circuits-qualitative and quantitative analysis with proper illustrations and necessary derivations of expressions.

UNIT-IV:

**Subsystem Design and Layout:** Some architectural issues, switch logic, gate logic, examples of structured design (combinational logic), some clocked sequential circuits, other system considerations.

**Subsystem Design Processes:** Some general considerations and an illustration of design processes, design of an ALU subsystem.

UNIT-V:

**Floor Planning:** Introduction, Floor planning methods, off-chip connections.

**Architecture Design:** Introduction, Register-Transfer design, high-level synthesis, architectures for low power, architecture testing.

**Chip Design:** Introduction and design methodologies.
TEXT BOOKS:


REFERENCE BOOKS:

ADVANCED DIGITAL SIGNAL PROCESSING
(ELECTIVE – II)

UNIT –I:
Review of DFT, FFT, IIR Filters and FIR Filters:
Multi Rate Signal Processing: Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion.

UNIT –II:
Applications of Multi Rate Signal Processing:

UNIT -III:
Non-Parametric Methods of Power Spectral Estimation: Estimation of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods

UNIT –IV:
Implementation of Digital Filters:
Introduction to filter structures (IIR & FIR), Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

UNIT –V:
TEXT BOOKS:

REFERENCE BOOKS:
TRANSDUCERS & INSTRUMENTATION LABORATORY

- The students are required to perform the following experiments using necessary software tools and hardware equipment.
- The simulated results should be analyzed with appropriate procedures.
- The students are required to develop the necessary algorithms, flow diagrams, source code and result description in case of software experiments.
- The students are required to analyze the hardware experiments with relevant applications.

List of Experiments:

PART-A

1. To determine the variation of Percent error of potentiometer using MATLAB.
2. To find the step response, Impulse response, Frequency response of First order and second order Instruments using MATLAB.
3. To find the variation of Gauge factor of a strain gauge with Poisson’s Ratio using MATLAB.
4. Simulation of PID Controller using Simulink.
5. Simulation of a digital control system using Simulink.

PART-B

1. LVDT Characteristics
2. Measurement of weight using Load cell
3. Measurement of Pressure using Strain Gauge
4. Temperature measurement using Thermistor, Thermocouple, RTD.
5. Study of PID Controller Characteristics using Temperature Process Controller
7. Study of PID Controller Characteristics using Pressure Process Controller
8. Study of PLC based controllers
UNIT-1

INTRODUCTION: Objective of a DAS, single channel DAS, Multi-channel DAS, Components used in DAS – Converter Characteristics – Resolution – Non-linearity, Settling time, Monotonicity.

UNIT-2


ADC APPLICATIONS: Data Acquisition systems – Digital signal processing systems – PCM voice communication systems – Test and measurement instruments – Electronic weighing machines.

UNIT-3

DIGITAL TO ANALOG CONVERTERS (DACs): Principles and design of – Parallel R–2R, Weighted resistor, inverted ladder, D/A decoding – Codes other than ordinary binary.

DATA CONVERTER APPLICATIONS: DAC applications – Digitally programmable V/I sources – Arbitrary waveform generators – Digitally programmable gain amplifiers – Analog multipliers/ dividers – Analog delay lines.

UNIT-4

Monolithic data converters: typical study of monolithic DACs and ADCs. Interfacing of DACS and ADCS to a µP.

UNIT-5

Error budget of DACS and ADCs: Error sources, error reduction and noise reduction techniques in DAS. Error budget analysis of DAS, case study of a DAC and an ADC.
TEXT BOOKS:


REFERENCES:

4. Data converters by G.B. Clayton
UNIT-I

UNIT-II

UNIT-III
Patient Care & Monitory and Measurements in Respiratory System: The elements of Intensive Care Monitory, Diagnosis, Calibration and reparability of Patient Monitoring equipment, other instrumentation for monitoring patients, pace makers, defibrillators, the physiology of respiratory system, tests and instrumentation for mechanics of breathing, respiratory theory equipment, analysis of respiration.

UNIT-IV
Bio telemetry and Instrumentation for the clinical laboratory Introduction to bio telemetry, Physiological parameters adaptable to bio telemetry, the components of bio telemetry system, implantable units, applications of telemetry in patient care – The blood, tests on blood cells, chemical test, automation of chemical tests.

UNIT-V
X-ray and radioisotope instrumentation and electrical safety of medical equipment: Generation of Ionizing radiation, instrumentation for diagnostic X-rays, special techniques, instrumentation for the medical use of radioisotopes, radiation therapy - Physiological effects of electrical current, shock Hazards from electrical equipment, Methods of accident prevention, Modern Imaging Systems: Tomography, Magnetic resonance Imaging System, Ultrasonic Imaging System, Medical Thermography.
TEXT BOOK:

Reference:
2. Introduction to Bio-Medical Engineering – Domach, (Pearson)
3. Introduction to Bio-Medical Equipment Technology – Cart, (Pearson)
UNIT-1
Control system parameters: control lag, dead time, cycling.
Discontinuous controller modes: two position, multi position, floating control modes.

UNIT-2

UNIT-3

UNIT-4

UNIT-5
Programmable controllers & Digital Controllers:
Programmable controllers:Ladder Diagram, Programmable controller program from the ladder diagram of simple applications.
Digital Controllers: Data logging, supervisory control, computer based controller.

Text Book:

Reference Books:
UNIT-I: Introduction

An Embedded System-Definition, Examples, Current Technologies, Integration in system Design, Embedded system design flow, hardware design concepts, software development, processor in an embedded system and other hardware units, introduction to processor based embedded system design concepts.

UNIT-II: Embedded Hardware

Embedded hardware building blocks, Embedded Processors – ISA architecture models, Internal processor design, processor performance, Board Memory – ROM, RAM, Auxiliary Memory, Memory Management of External Memory, Board Memory and performance.

Embedded board Input / output – Serial versus Parallel I/O, interfacing the I/O components, I/O components and performance, Board buses – Bus arbitration and timing, Integrating the Bus with other board components, Bus performance.

UNIT-III: Embedded Software

Device drivers, Device Drivers for interrupt-Handling, Memory device drivers, On-board bus device drivers, Board I/O drivers, Explanation about above drivers with suitable examples.

Embedded operating systems – Multitasking and process Management, Memory Management, I/O and file system management, OS standards example – POSIX, OS performance guidelines, Board support packages, Middleware and Application Software – Middleware, Middleware examples, Application layer software examples.


Embedded system design and development lifecycle model, creating an embedded system architecture, introduction to embedded software development process and tools- Host and Target machines, linking and locating software, Getting embedded software into the target system, issues in Hardware-Software design and co-design.

Implementing the design-The main software utility tool, CAD and the hardware, Translation tools, Debugging tools, testing on host machine, simulators, Laboratory tools, System Boot-Up.
UNIT-V: Embedded System Design-Case Studies

Case studies- Processor design approach of an embedded system –Power PC Processor based and Micro Blaze Processor based Embedded system design on Xilinx platform-NiosII Processor based Embedded system design on Altera platform-Respective Processor architectures should be taken into consideration while designing an Embedded System.

TEXT BOOKS:


REFERENCE BOOKS:


NON-LINEAR & OPTIMAL CONTROL SYSTEMS
(ELECTIVE-IV)

Non-linear control systems

Unit – I
Introduction to Non-Linear Control systems.
Describing Functions, Describing function Analysis of Non-Linear Control Systems.

Unit – II
Introduction to Phase plane analysis, Methods for constructing Trajectories, singular points, phase-plane analysis of linear control systems and Non-linear control systems.
Introduction to liapunov stability analysis, second method of liapunov, stability analysis of linear systems, stability analysis of nonlinear systems (Variable gradient method and Krosovskii’s method)

Optimal Control systems

Unit –III
Introduction to optimal control system, Formulation of optimal Control problem – Characteristics of the plant, requirements made upon the plant, Nature of information about the plant supplied to the controller.
Calculus of variations – fixed end problem and variable end problems

Unit – IV
Pontragain’s minimum/maximum principle, Hamilton Jacobii’s approach, Matrix-Riccati equations..

Unit – V
Dynamic Programming,

Text Books:
I Year II Semester

L P C
4 0 3

PC BASED INSTRUMENTATION

(ELECTIVE – III)
UNIT-I:

Introduction to Digital Signal Processing
Introduction, a Digital signal-processing system, the sampling process, discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation.

Computational Accuracy in DSP Implementations
Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT-II:

Architectures for Programmable DSP Devices
Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT-III:

Programmable Digital Signal Processors
Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX Instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX Processors, Pipeline Operation of TMS320C54XX Processors.

UNIT-IV:

Analog Devices Family of DSP Devices

Introduction to Black fin Processor - The Black fin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.
UNIT-V:

Interfacing Memory and I/O Peripherals to Programmable DSP Devices

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

TEXT BOOKS:


REFERENCE BOOKS:

3. Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI
ELECTROMAGNETIC INTERFERENCE AND ELECTROMAGNETIC
COMPATIBILITY (EMI / EMC)

(ELECTIVE-IV)

UNIT -I:
Introduction, Natural and Nuclear Sources of EMI / EMC:
Electromagnetic environment, History, Concepts, Practical experiences and concerns, frequency
spectrum conservations, An overview of EMI / EMC, Natural and Nuclear sources of EMI.

UNIT -II:
EMI from Apparatus, Circuits and Open Area Test Sites:
Electromagnetic emissions, Noise from relays and switches, Non-linearities in circuits, passive
intermodulation, Cross talk in transmission lines, Transients in power supply lines, Electromagnetic interference (EMI), Open area test sites and measurements.

UNIT -III:
Radiated and Conducted Interference Measurements and ESD:
Anechoic chamber, TEM cell, GH TEM Cell, Characterization of conduction currents / voltages, Conducted EM noise on power lines, Conducted EMI from equipment, Immunity to conducted EMI detectors and measurements, ESD, Electrical fast transients / bursts, Electrical surges.

UNIT -IV:
Grounding, Shielding, Bonding and EMI filters:
Principles and types of grounding, Shielding and bonding, Characterization of filters, Power lines filter design.

UNIT -V:
Cables, Connectors, Components and EMC Standards:
EMI suppression cables, EMC connectors, EMC gaskets, Isolation transformers, optoisolators, National / International EMC standards.
TEXT BOOKS:


REFERENCE BOOKS:

CONTROL AND GUIDANCE SYSTEMS  
(ELECTIVE-IV)

Unit – I
The Accuracy of Target Trackers: 

Unit – II
Missile Servos & control Methods: 
Servo requirements, Stored cold gas servos, Hot gas servos, Ram air servos, Hydraulic servos, Electric servos with d.c. motors, Other electric servos, Some tentative conclusions.

Missile control Methods: 
Introduction, Why not manoeuvre by banking?, Roll control, Aerodynamic lateral control, Aerodynamic polar control versus cartesian control, Thrust vector control, Methods of thrust vectoring.

Unit – III
Aerodynamic Derivatives and Aerodynamic Transfer Functions: 
Notation and conventions, Euler’s equations of motion for a rigid body, Trajectory considerations, Control surface conventions, Aerodynamic derivatives, Aerodynamic transfer functions, Altitude and speed conversion factors, Aerodynamic derivatives with TVC.

Unit – IV
Missile Instruments: 
Introduction, Elementary theory of gyroscopes, Free or position gyros, Rate or constrained gyros, Accelerometers, Resolvers, Altimeters.

Line of Sight Guidance Loops: 

Unit – V
Homing Heads and Some Associated Stability Problems: 

Proportional Navigation and Homing Guidance Loops: 
Introduction, A particular case, The mathematical model, A summary of previous work, The effect of a missile heading error, Miss distance due to a target lateral acceleration, Miss distance die to angular noise, Miss distance due to glint, Three dimensional homing, An integrated form of proportional navigation, Other homing guidance laws.

Text Book: 

Reference Book: 
Guided Weapons by R.G. Lee et al., Brassey’s Defence Publishers.
ANALYTICAL INSTRUMENTATION

(ELECTIVE – IV)
PROCESS CONTROL INSTRUMENTATION LABORATORY

OBJECTIVES:
To experimentally verify the process control concepts on the selected process control loops using LabVIEW and Experimental Trainers.

OBJECTIVES:
Ability to understand and analyse process control engineering problems.

List of Experiments:

PART-A

Using Quanser DC Motor control hardware / Heating Ventilation & Airconditioning hardware and LabVIEW

1. Mathematical Modeling and simulation
2. Qualitative PD Control
3. PD Control to Specifications
4. Qualitative PI Control
5. PI Control to Specifications
6. PID Controller Design
7. Stability analysis
8. Time domain analysis
9. Frequency domain analysis
10. Fuzzy controller design
11. Special control design

PART-B

1. Study of Process Control Training Plant and Compact Flow Control Unit
2. Characteristics of Pneumatically Actuated Control Valve
3. Level Control and Pressure Control in Process Control Training Plant
4. Design of ON/OFF Controller for the Temperature Process
5. PID Implementation Issues
6. Tuning of PID Controller for mathematically described processes
7. PID Enhancements (Cascade and Feed-forward Control Schemes)
8. Design and Implementation of Multi-loop PI Controller on the Three-tank system
9. Analysis of Multi-input Multi-output system (Four-tank System)
10. Auto-tuning of PID Controller
ACADEMIC REGULATIONS & COURSE STRUCTURE

For

MICROWAVE & COMMUNICATION ENGINEERING

(Applicable for batches admitted from 2016-2017)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India
### I Semester

<table>
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<td>3. Radio &amp; Navigational Aids</td>
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<td>3. Radar Signal Processing</td>
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### IV Semester

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UNIT -I: 
**Fundamental Concepts:**
Introduction, Basic Equations, constitutive relations, generalized current concepts, energy and power, circuit concepts, complex quantities, complex equations, complex constitutive parameters, complex power, A-C Characteristics of matter, A discussion of current, A-C behavior circuit elements, Singularities of field.

UNIT -II: 
**Introduction of Waves:**
Wave Equation, Waves in perfect dielectrics, Intrinsic wave constants, waves in lossy matter, reflection of waves, transmission line concepts, waveguide concepts, resonator concepts, radiation, and antenna concepts.

UNIT -III: 
**Some Theorems & Concepts:**
Source concepts, duality, uniqueness, Image theory, Equivalence principle, fields in off space, Induction theorem, reciprocity, Green’s functions, Integral equations, construction of solutions, the radiation field.

UNIT -IV: 
**Plane Wave Functions:**
Wave functions, Plane waves, rectangular waveguides, alternative mode sets, Rectangular cavity, partially filled wave guide, dielectric- slab guide, surface guided waves, modal Expansions of fields, currents in waveguides, Apertures in ground planes.

UNIT -V: 
**Perturbational and Variational Techniques:**
Intraduction, perturbation of cavity walls, cavity material perturbations, waveguide perturbations, stationary formulas for cavity, Ritz procedure, reaction concepts, stationary formulas for waveguides,stationary formulas for impedance, stationary formulas for scattering,scattering by dielectric obstacles, transmission through Apertures.

**TEXT BOOKS:**
REFERENCE BOOKS:

2. ‘Advanced Engineering Electromagnetics’ by C.A. Balmain, Wiley India, Pvt. Ltd., 2005
MICROWAVE COMPONENTS AND MEASUREMENTS

UNIT -I:
Microwave Circuits & Theorems:
Equation of Voltage and Currents, Impedance description of waveguide circuits, Fosters reactance theorem, N-Port circuits, Two-port junctions, S-matrix formulation and properties, Illustrative problems.

UNIT -II:
Impedance Matching:
Impedance matching Concepts, Quarter wave Transformers, Theory of small reflections, single and multi sections, Binomial and Cheyshev Transformers.

UNIT -III:
Passive Microwave Components:

UNIT -IV:
Microwave Measurements-I:

UNIT -V:
Microwave Measurements-II:
Vector Network analyzer, Concept and description, Reflection and Transmission measurements, magnitude and Phase, measurement of S- Parameters, SWR and Impedances measurements, errors and corrections.

TEXT BOOKS:

REFERENCE BOOKS:

UNIT –I:

**Varactor Diode:** Equivalent circuit, static and dynamic figures of merit Manley Rowe power relation, Parametric amplifiers, Up converter, Degeneration amplifiers, Varactor multipliers, Charge storage capacitance.

UNIT –II:

**Tunnel Diode:**


UNIT –III:

**PIN Diodes:**

Description, the I-layer, Equivalent circuit behavior under reverse bias and forward bias, Diode impedance, Materials, Applications.

UNIT –IV;

**Schottky Barrier Diode:**

Physics of Schottky barriers, Design of and performance of Schottky barrier diode applications, IMPATT & TRAPATT diodes: Principles and applications as amplifiers and oscillators.

UNIT –V:

**Microwave Transistor:**

Wafer design. Equivalent circuit, Design compromises, Package design.

TEXT BOOKS:


REFERENCE:

UNIT -I:
Digital Modulation Schemes:
BPSK, QPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK – Methods, Band Width Efficiency, Carrier Recovery, Clock Recovery.

UNIT -II:
Basic Concepts of Data Communications, Interfaces and Modems:

UNIT -III:
Error Correction: Types of Errors, Vertical Redundancy Check (VRC), LRC, CRC, Checksum, Error Correction using Hamming code
Data Link Control: Line Discipline, Flow Control, Error Control

UNIT -IV:
Multiplexing: Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Multiplexing Application, DSL.
Local Area Networks: Ethernet, Other Ether Networks, Token Bus, Token Ring, FDDI.
Metropolitan Area Networks: IEEE 802.6, SMDS
Switching: Circuit Switching, Packet Switching, Message Switching.
Networking and Interfacing Devices: Repeaters, Bridges, Routers, Gateway, Other Devices.

UNIT -V:
Multiple Access Techniques:
Frequency- Division Multiple Access (FDMA), Time - Division Multiple Access (TDMA), Code - Division Multiple Access (CDMA), OFDM and OFDMA. Random Access, Aloha- Carrier Sense Multiple Access (CSMA)- Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA), Controlled Access- Reservation- Polling- Token Passing, Channelization.

TEXT BOOKS:
REFERENCE BOOKS:
1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
UNIT I

MIC Technology – Thick film and Thin film technology, Hybrid MIC’s, Monolithic MIC technology.

UNIT II

Analysis of stripline and microstripline, Method of conformal Transformation, Characteristic parameters of strip, Microstrip lines, Microstrip Circuit Design, Impedance transformers, Filters, Lumped constant Microstrip circuits.

UNIT III

Coupled Microstrips and Directional couplers, Even and odd mode analysis, Theory of coupledmicrostrip Directional couplers, Calculations for a coupled pair of Microstrips, Branch line couplers.

UNIT IV

Lumped Elements for MIC’s Design and fabrication of lumped elements, circuits using lumped elements.

UNIT V

Nonreciprocal components for MIC’s Microstrip on Ferrimagnetic substrates, Microstrip circulators. Isolators and phase shifters, Design of microstrip circuits – high power and low power circuits.

TEXT BOOKS:


2. Leo Young - Advances in Microwaves, Academic Press.

REFERENCE BOOKS:

UNIT –I:
Review of DFT, FFT, IIR Filters and FIR Filters:
Multi Rate Signal Processing: Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion.

UNIT –II:
Applications of Multi Rate Signal Processing:

UNIT -III:
Non-Parametric Methods of Power Spectral Estimation: Estimation of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods

UNIT –IV:
Implementation of Digital Filters:
Introduction to filter structures (IIR & FIR), Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

UNIT –V:

TEXT BOOKS:
REFERENCE BOOKS:
DETECTION AND ESTIMATION THEORY
(ELECTIVE-I)

UNIT –I:
Random Processes:
Discrete Linear Models, Markov Sequences and Processes, Point Processes, and Gaussian Processes.

UNIT –II:
Detection Theory:
Basic Detection Problem, Maximum A posteriori Decision Rule, Minimum Probability of Error Classifier, Bayes Decision Rule, Multiple-Class Problem (Bayes)- minimum probability error with and without equal a priori probabilities, Neyman-Pearson Classifier, General Calculation of Probability of Error, General Gaussian Problem, Composite Hypotheses.

UNIT –III:
Linear Minimum Mean-Square Error Filtering:
Linear Minimum Mean Squared Error Estimators, Nonlinear Minimum Mean Squared Error Estimators. Innovations, Digital Wiener Filters with Stored Data, Real-time Digital Wiener Filters, Kalman Filters.

UNIT –IV:
Statistics:

UNIT –V:
Estimating the Parameters of Random Processes from Data:

TEXT BOOKS:
REFERENCE BOOKS:
3. Introduction to Statistical Signal Processing with Applications - Srinath, Rajasekaran, Viswanathan, 2003, PHI.
UNIT –I:
Signal propagation in Optical Fibers:

UNIT –II:
Fiber Optic Components for Communication & Networking:
Couplers, Isolators and Circulators, Multiplexers, Bragg Gratings, Fabry-Perot Filters, Mach Zender Interferometers, Arrayed Waveguide Grating, Tunable Filters, High Channel Count Multiplexer Architectures, Optical Amplifiers, Direct and External Modulation Transmitters, Pump Sources for Amplifiers, Optical Switches and Wavelength Converters.

UNIT –III:
Modulation and Demodulation:

UNIT -IV:
Transmission System Engineering:
System Model, Power Penalty in Transmitter and Receiver, Optical Amplifiers, Crosstalk and Reduction of Crosstalk, Cascaded Filters, Dispersion Limitations and Compensation Techniques.

UNIT –V:
Fiber Non-linearities and System Design Considerations:
Limitation in High Speed and WDM Systems due to Non-linearities in Fibers, Wavelength Stabilization against Temperature Variations, Overall System Design considerations – Fiber Dispersion, Modulation, Non-Linear Effects, Wavelengths, All Optical Networks.

TEXT BOOKS:
REFERENCE BOOKS:
2. Fiber Optics Communication – Harold Kolimbris, 2\textsuperscript{nd} Ed., 2004, PEI
3. Optical Networks: Third Generation Transport Systems – Uyless Black, 2\textsuperscript{nd} Ed., 2009, PEI
4. Optical Fiber Communications – Govind Agarwal, 2\textsuperscript{nd} Ed., 2004, TMH.
UNIT I

Signal models and characterization: Types and properties of statistical models for signals and how they relate to signal processing. Common second-order methods of characterizing signals including autocorrelation, partial correlation, cross-correlation, power spectral density and cross-power spectral density.

UNIT II

Spectral estimation: Nonparametric methods for estimation of power spectral density, autocorrelation, cross-correlation, transfer functions, and coherence form finite signal samples.

UNIT III

Review of signal processing: A review on random processes, A review on filtering random processes, Examples.

Statistical parameter estimation: Maximum likelihood estimation, maximum a posterior stimation, Cramer-Rao bound.

UNIT IV

Eigen structure based requency estimation: Pisarenko, MUSIC, ESPRIT their application sensor array direction finding.

Spectrum estimation: Moving average (MA), Auto Regressive (AR), Auto Regressive Moving Average (ARMA), Various non-parametirc approaches.

UNIT V

Wiener filtering: The finite impulse case, causal and non-causal infinite impulse responses cases, Least mean squares adaptation, recursive least squares adaptation, Kalman filtering.

Text books:


Reference books:
UNIT –I:

Introduction:
Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, Knowledge representation - Expert systems.

UNIT –II:

Artificial Neural Networks:
Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron, Learning and Training the neural network, Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.

UNIT –III:

Fuzzy Logic System:
Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modeling and control schemes for nonlinear systems, Self-organizing fuzzy logic control, Fuzzy logic control for nonlinear time delay system.

UNIT –IV:

Genetic Algorithm:
Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search and anD-colony search techniques for solving optimization problems.

UNIT –V:

Applications:
TEXT BOOKS:


REFERENCE BOOKS:

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MICROWAVE MEASUREMENTS LABORATORY

Note: All the Experiments are to be conducted preferably using X-band setup.

1. Microwave source characteristics-Reflex Klystron and Gunn oscillator
2. Waveguide Discontinuities-Inductive and capacitive Diaphragms
3. Slide Screw Tuner-Equivalent circuit
4. S-matrix of Directional Coupler, Circulator, Magic Tee
5. Gain measurement of 1) Pyramidal Horn, 2) Conical Horn antennas.
6. Characterization of Waveguide Slotted Array
7. Frequency Scanned Array Characteristics
8. Measurement of Input Impedance of an Antenna
9. Measurements with Network Analyzer
UNIT -I:

Antenna Theory:

Antennas, Radiation concept, Types of Antennas, Antenna parameters, Friis Transmission equation.

UNIT -II:

Aperture Antenna:

UNIT -III:

Microstrip Radiators:


UNIT -IV:

Microstrip Slot Antennas:

Wave guide fed slots, Radiational mechanism, Micro strip slot antennas, Introduction rectangular slot antennas, narrow, wide, tapered and circularly polarized slot antennas, Annular slot antennas, Comparison of microstrip slot antennas with patch antennas.

UNIT -V:

Micro Strip Antenna Arrays:

Introduction, Micro strip array antennas, Characteristics of fixed beam linear antenna arrays, Linear micro strip arrays, Characteristics of planar arrays, Microstrip planar arrays, Microstrip scanned array antennas, Phase scanned microstrip arrays, Time delay scanning, Electronic feed switching, Frequency scanned microstrip arrays, Advantage and disadvantages of phased array antennas.

TEXT BOOKS:

REFERENCE BOOKS:
UNIT –I:

Conventional Scanning Techniques:

Mechanical versus electronic scanning, Techniques of Electronic scanning, Frequency, Phase and time delay scanning principle, Hybrid scanning techniques.

UNIT –II:

Array Theory:

Linear and Planner arrays, various grid configuration, Concept of cell and grid, Calculation of minimum number of elements, Radiation pattern, Grating lobe formation, Rectangular and triangular grid design of arrays.

UNIT –III:

Feed Networks for phased Arrays:

Corporate Feed, Lens and Reflect feed

Techniques, Optimum f/d ratio basic building block for corporate feed network, Series, Parallel feed networks, Comparison of various feeding techniques, Antenna Array Architecture, Brick/Tile Type construction.

UNIT –IV:

Frequency Scanned Array Design:

Snake feed, Frequency-phase scanning, Phase scanning, Digital phase shifter PIN diode and Ferrite phase shifters for phased arrays, Beam pointing errors due to digitalization, Beam pointing accuracy.

UNIT –V:

Search Patterns:

Calculation of search frame time, airborne phased array design, Electronic scanning radar parameter calculation, Application of phased arrays, Phased Array Radar Systems, Active Phased Array, TR/ATR Modules.
TEXT BOOKS:

REFERENCE BOOKS:
UNIT -I:
Introduction:
The Need for Software Radios, What is Software Radio, Characteristics and benefits of software radio- Design Principles of Software Radio, RF Implementation issues- The Purpose of RF Front – End, Dynamic Range- The Principal Challenge of Receiver Design – RF Receiver Front- End Topologies- Enhanced Flexibility of the RF Chain with Software Radios-Importance of the Components to Overall Performance- Transmitter Architectures and Their Issues- Noise and Distortion in the RF Chain, ADC and DAC Distortion.

UNIT -II:
Multi Rate Signal Processing:
Introduction- Sample Rate Conversion Principles- Polyphase Filters- Digital Filter Banks-Timing Recovery in Digital Receivers Using Multirate Digital Filters.
Digital Generation of Signals:

UNIT -III:
Analog to Digital and Digital to Analog Conversion:
Parameters of ideal data converters- Parameters of Practical data converters- Analog to Digital and Digital to Analog Conversion- Techniques to improve data converter performance- Common ADC and DAC architectures.

UNIT -IV:
Digital Hardware Choices:
Introduction- Key Hardware Elements- DSP Processors- Field Programmable Gate Arrays-Trade-Offs in Using DSPs, FPGAs, and ASICs- Power Management Issues- Using a Combination of DSPs, FPGAs, and ASICs.

UNIT -V:
Object – Oriented Representation of Radios and Network Resources:
Networks- Object Oriented Programming- Object Brokers- Mobile Application Environments-Joint Tactical Radio System.
TEXT BOOKS:

REFERENCE BOOKS:
UNIT -I:
The Cellular Concept-System Design Fundamentals:
Introduction, Frequency Reuse, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference, Power Control for Reducing interference, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Trunking and Grade of Service

UNIT –II:
Mobile Radio Propagation: Large-Scale Path Loss:

UNIT –III:
Mobile Radio Propagation: Small –Scale Fading and Multipath
Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke’s model for flat fading, spectral shape due to Doppler spread in Clarke’s model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.
UNIT -IV:
**Equalization and Diversity**

UNIT -V:
**Wireless Networks**
Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, HiperLan, WLL.

TEXT BOOKS:

REFERENCE BOOKS:
2. Wireless Digital Communications – KamiloFeher, 1999, PHI.
MICROWAVE NETWORKS
(ELECTIVE-III)

UNIT –I:

Introduction to Microwave Circuit Concept:

One port junction, Terminal voltage and currents in multipart junctions, Poynting’s energy theorem, Normalized waves and scattering matrix. Properties of \([s]\)matrix

UNIT –II:

Relationship between \([s]\), \([z]\) and \([y]\) Parameters:

Wave amplitude transmission matrix\([A]\), Relation between \([A]\) and \([s]\), \([s]\) matrix of magic T, E and H plane tees, Directional coupler, Applications of hybrid junction and magic tee.

UNIT –III:

Passive Microwave Devices:

Even and odd mode analysis of symmetrical 4 port networks, Analysis and design of branch line couplers, Hybrid ring coupler, Frequency response, Branching synthesis of hybrids, Applications of hybrids.

UNIT –IV:

Microwave Propagation in Ferrites:

Principles of Faraday rotation, Isolator, Gyrator, Circulator, Phase shifters, S-matrix of non reciprocal devices, Broad band matching multisection quarter wave transformers, Binomial and Chebyshev transformers design, Tapered transmission line exponential and triangular tapers, Synthesis of transmission line tapers.

UNIT –V:

Wave Analysis of Periodic Structures:

Image parameters method of micro wave filter design, Power loss ratio, Filter design by insertion loss method, Frequency transformation maximally flat and Chebyshev filter design and characteristics.
TEXT BOOKS:


REFERENCE BOOKS:

I Year II Semester

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ELECTROMAGNETIC INTERFERENCE AND ELECTROMAGNETIC COMPATIBILITY (EMI / EMC)

(ELECTIVE-III)

UNIT -I:

Introduction, Natural and Nuclear Sources of EMI / EMC:

Electromagnetic environment, History, Concepts, Practical experiences and concerns, frequency spectrum conservations, An overview of EMI / EMC, Natural and Nuclear sources of EMI.

UNIT -II:

EMI from Apparatus, Circuits and Open Area Test Sites:

Electromagnetic emissions, Noise from relays and switches, Non-linearities in circuits, passive intermodulation, Cross talk in transmission lines, Transients in power supply lines, Electromagnetic interference (EMI), Open area test sites and measurements.

UNIT -III:

Radiated and Conducted Interference Measurements and ESD:

Anechoic chamber, TEM cell, GH TEM Cell, Characterization of conduction currents / voltages, Conducted EM noise on power lines, Conducted EMI from equipment, Immunity to conducted EMI detectors and measurements, ESD, Electrical fast transients / bursts, Electrical surges.

UNIT -IV:

Grounding, Shielding, Bonding and EMI filters:

Principles and types of grounding, Shielding and bonding, Characterization of filters, Power lines filter design.

UNIT -V:

Cables, Connectors, Components and EMC Standards:

EMI suppression cables, EMC connectors, EMC gaskets, Isolation transformers, optoisolators, National / International EMC standards.
TEXT BOOKS:


REFERENCE BOOKS:

UNIT –I:
Navigational Systems:

UNIT -II:
Inertial Navigation:
Inertial navigation system, Sensing instruments: Accelerometer, Gyro- scopes, Analytic and Gimbaled platforms, Mechanization, Error analysis, Alignment.

UNIT –III:
Global Positioning System (GPS) for Navigation:
Overview of GPS, Reference systems, Satellite orbits, Signal structure, Geometric dilution of precision (GDOP), or Precision dilution of recision (PDOP), Satellite ephemeris, Satellite clock, Ionospheric group delay, Tropospheric group delay, Multipath errors and Receiver measurement errors.

UNIT -IV:
Differential GPS and WAAS:
Standard and precise positioning service local area DGPS and Wide area DGPS errors, Wide Area Augmentation System (WAAS) architecture, Link budget and Data Capacity, Ranging function, Precision approach and error estimates.

UNIT –V:
GPS Navigational Applications:
General applications of GPS, DGPS, Marine, Air and Land Navigation, Surveying, Mapping and Geographical information systems, Military and Space.

TEXT BOOKS:
REFERENCE BOOKS:
SMART ANTENNAS
(ELECTIVE-IV)

UNIT -I:

Smart Antennas:

Introduction, Need for Smart Antennas, Overview, Smart Antenna Configurations, Switched-Beam Antennas, Adaptive Antenna Approach, Space Division Multiple Access (SDMA), Architecture of a Smart Antenna System, Receiver, Transmitter, Benefits and Drawbacks, Basic Principles, Mutual Coupling Effects.

UNIT -II:

DOA Estimation Fundamentals:

Introduction, Array Response Vector, Received Signal Model, Subspace-Based Data Model, Signal Autocovariance, Conventional DOA Estimation Methods, Conventional Beamforming Method, Capon’s Minimum Variance Method, Subspace Approach to DOA Estimation, MUSIC Algorithm, ESPRIT Algorithm, Uniqueness of DOA Estimates.

UNIT -III:

Beam Forming Fundamentals:

Classical Beamformer, Statistically Optimum Beamforming Weight Vectors, Maximum SNR Beamformer, Multiple Sidelobe Canceller and Maximum, SINR Beamformer, Minimum Mean Square Error (MMSE), Direct Matrix Inversion (DMI), Linearly Constrained Minimum Variance (LCMV), Adaptive Algorithms for Beamforming

UNIT -IV:

Integration and Simulation of Smart Antennas:

UNIT -V:

Space–Time Processing:


TEXT BOOKS:


REFERENCE BOOKS:

UNIT -I:
Introduction to RF Electronics:

UNIT -II:

UNIT -III:
Matching and Biasing Networks:

UNIT -IV:

UNIT -V:
Oscillators: Oscillator basics, Low phase noise oscillator design, High frequency Oscillator configuration, LC Oscillators, VCOs, Crystal Oscillators, PLL Synthesizer, and Direct Digital Synthesizer. RF Mixers: Basic characteristics of a mixer - Active mixers- Image Reject and Harmonic mixers, Frequency domain considerations.

TEXT BOOKS:
REFERENCE BOOKS:
1. Radio frequency and Microwave Electronics - Mathew M. Radmangh, 2001, PE Asia Publ.
UNIT -I:
Introduction:

UNIT -II:
Detection of Radar Signals in Noise:

UNIT -III:
Waveform Selection [3, 2]:

UNIT -IV:
Pulse Compression in Radar Signals:

UNIT V:
Phase Coding Techniques:
Principles, Binary Phase Coding, Barker Codes, Maximal Length Sequences (MLS/LRS/PN), Block Diagram of a Phase Coded CW Radar.
Poly Phase Codes : Frank Codes, Costas Codes, Non-Linear FM Pulse Compression, Doppler Tolerant PC Waveforms – Short Pulse, Linear Period Modulation (LPM/HFM), Sidelobe Reduction for Phase Coded PC Signals.
TEXT BOOKS:

REFERENCE BOOKS:
ANTENNA SIMULATION LABORATORY

SECTION –A
Design and testing of microwave Antennas operations:

1. Pyramidal Horn- Antenna
2. Conical Horn –Antenna
3. Rectangular Microstrip patch Antenna
4. Circular Microstrip patch Antenna
5. Microstrip Monopole Antenna.

SECTION –B
Software Simulation (using HFSS/IE3D/FEKO or Equivalent) and Testing of:

1. Rectangular Microstrip Antenna, Circular Microstrip antenna.
2. Micro strip Monopole
3. Microstrip Tee
4. Cylindrical Horn antenna, Pyramidal Horn antenna
5. Microstrip Filters
6. Microstrip power Dividers, Passive Components
7. Radar Signals
ACADEMIC REGULATIONS & COURSE STRUCTURE

For

SSP, DIP, CE&SP AND IP

(Applicable for batches admitted from 2016-2017)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India
### I Semester

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**Total Credits** 20

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**Total Credits** 20
### III Semester

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### IV Semester

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UNIT –I:
Coding for Reliable Digital Transmission and Storage:
Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

Linear Block Codes:
Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

UNIT –II:
Cyclic Codes:
Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding, Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT –III:
Convolutional Codes:
Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority-logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT –IV:
Burst –Error-Correcting Codes:

UNIT -V:
BCH – Codes:
BCH code- Definition, Minimum distance and BCH Bounds, Decoding Procedure for BCH Codes- Syndrome Computation and Iterative Algorithms, Error Location Polynomials and Numbers for single and double error correction
TEXT BOOKS:

REFERENCE BOOKS:
1. Digital Communications-Fundamental and Application - Bernard Sklar, PE.
3. Introduction to Error Control Codes-Salvatore Gravano-oxford
5. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Ed, 2009, TMH.
UNIT -I:
Fourier Analysis:

UNIT -II:
Transforms:
Walsh, Hadamard, Haar and Slant Transforms, DCT, DST, KLT, Singular value Decomposition – definition, properties and applications

UNIT -III:
Continuous Wavelet Transform (CWT):
Short comings of STFT, Need for wavelets, Wavelet Basis- Concept of Scale and its relation with frequency, Continuous time wavelet Transform Equation- Series Expansion using Wavelets- CWT- Tiling of time scale plane for CWT. Important Wavelets: Haar, Mexican Hat, Meyer, Shannon, Daubechies.

UNIT -IV:
Multi Rate Analysis and DWT:
Need for Scaling function – Multi Resolution Analysis, Two-Channel Filter Banks, Perfect Reconstruction Condition, Relationship between Filter Banks and Wavelet Basis, DWT, Structure of DWT Filter Banks, Daubechies Wavelet Function, Applications of DWT.

UNIT -V:
Wavelet Packets and Lifting: Wavelet Packet Transform, Wavelet packet algorithms, Thresholding-Hard thresholding, Soft thresholding, Multidimensional Wavelets, Bi-orthogonal basis- B-Splines, Lifting Scheme of Wavelet Generation, Multi Wavelets

TEXT BOOKS:
REFERENCE BOOKS:

UNIT –I:
**Review of DFT, FFT, IIR Filters and FIR Filters:**
Multi Rate Signal Processing: Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion.

UNIT –II:
**Applications of Multi Rate Signal Processing:**

UNIT –III:
**Non-Parametric Methods of Power Spectral Estimation:** Estimation of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods

UNIT –IV:
**Implementation of Digital Filters:**
Introduction to filter structures (IIR & FIR), Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

UNIT –V:

**TEXT BOOKS:**
REFERENCE BOOKS:

UNIT -I:
Digital Modulation Schemes:
BPSK, QPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK – Methods, Band Width Efficiency, Carrier Recovery, Clock Recovery.

UNIT -II:
Basic Concepts of Data Communications, Interfaces and Modems:

UNIT -III:
Error Correction: Types of Errors, Vertical Redundancy Check (VRC), LRC, CRC, Checksum, Error Correction using Hamming code
Data Link Control: Line Discipline, Flow Control, Error Control

UNIT -IV:
Multiplexing: Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Multiplexing Application, DSL.
Local Area Networks: Ethernet, Other Ether Networks, Token Bus, Token Ring, FDDI.
Metropolitan Area Networks: IEEE 802.6, SMDS
Switching: Circuit Switching, Packet Switching, Message Switching.
Networking and Interfacing Devices: Repeaters, Bridges, Routers, Gateway, Other Devices.

UNIT -V:
Multiple Access Techniques:
Frequency- Division Multiple Access (FDMA), Time - Division Multiple Access (TDMA), Code - Division Multiple Access (CDMA), OFDM and OFDMA. Random Access, Aloha- Carrier Sense Multiple Access (CSMA)- Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA), Controlled Access- Reservation- Polling- Token Passing, Channelization.
TEXT BOOKS:

REFERENCE BOOKS:
1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
UNIT I

Signal models and characterization: Types and properties of statistical models for signals and how they relate to signal processing, Common second-order methods of characterizing signals including autocorrelation, partial correlation, cross-correlation, power spectral density and cross-power spectral density.

UNIT II

Spectral estimation: Nonparametric methods for estimation of power spectral density, autocorrelation, cross-correlation, transfer functions, and coherence form finite signal samples.

UNIT III


UNIT IV

Eigen structure based frequency estimation: Pisarenko, MUSIC, ESPRIT their application sensor array direction finding.

Spectrum estimation: Moving average (MA), Auto Regressive (AR), Auto Regressive Moving Average (ARMA), Various non-parametric approaches.

UNIT V

Wiener filtering: The finite impulse case, causal and non-causal infinite impulse responses cases, Least mean squares adaptation, recursive least squares adaptation, Kalman filtering.

Text books:


Reference books:

UNIT -I:
Introduction:

Modern Techniques:
Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operations.

UNIT -II:
Encryption Algorithms:

UNIT -III:
Public Key Cryptography: Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography. Number Theory: Prime and Relatively prime numbers, Modular arithmetic, Fermat’s and Euler’s theorems, Testing for primality, Euclid’s Algorithm, the Chinese remainder theorem, Discrete logarithms.

UNIT -IV:

UNIT -V:
IP Security:

Intruders, Viruses and Worms
Intruders, Viruses and Related threats.

Fire Walls: Fire wall Design Principles, Trusted systems.
TEXT BOOKS:

REFERENCE BOOKS:
1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
5. Introduction to Cryptography, Buchmann, Springer.
UNIT I : Introduction:
Fundamental problems in pattern Recognition system design, Design concepts and methodologies, Simple pattern recognition model.

Decisions and Distance Functions:
Linear and generalized decision functions, Pattern space and weight space, Geometrical properties, implementations of decision functions, Minimum-distance pattern classifications.

Probability - Probability of events:
Random variables, Joint distributions and densities, Movements of random variables, Estimation of parameter from samples.

UNIT - II: Decision making - Baye’s theorem, Multiple features, Conditionally independent features, Decision boundaries, Unequal cost of error, estimation of error rates, the leaving-one-out-techniques, characteristic curves, estimating the composition of populations. Baye’s classifier for normal patterns.

Non Parametric Decision Making:
histogram, kernel and window estimation, nearest neighbour classification techniques. Adaptive decision boundaries, adaptive discriminant functions, Minimum squared error discriminant functions, choosing a decision making techniques.

UNIT III: Clustering and Partitioning:
Hierarchical Clustering: Introduction, agglomerative clustering algorithm, the single-linkage, complete-linkage and average-linkage algorithm. Ward’s method Partition clustering-Forg’s algorithm, K-means’s algorithm, Isodata algorithm.

UNIT IV: Pattern Preprocessing and Feature selection:
distance measures, clustering transformation and feature ordering, clustering in feature selection through entropy minimization, features selection through orthogonal expansion, binary feature selection.

UNIT V: Syntactic Pattern Recognition and Application of Pattern Recognition:
Concepts from formal language theory, formulation of syntactic pattern recognition problem, syntactic pattern description, recognition grammars, automata as pattern recognizers, Application of pattern recognition techniques in bio-metric, facial recognition, IRIS scon, Finger prints, etc.,
Reference books:
1. Pattern recognition and Image Analysis, Gose. JohnsonbaughJost, PHI.
SPEECH PROCESSING
(ELECTIVE – II)

UNIT –I:  
**Fundamentals of Digital Speech Processing:**

UNIT –II:  
**Time Domain Models for Speech Processing:**
Introduction- Window considerations, Short time energy and average magnitude Short time average zero crossing rate, Speech Vs Silence discrimination using energy and zero crossing, Pitch period estimation using a parallel processing approach, The short time autocorrelation function, The short time average magnitude difference function, Pitch period estimation using the autocorrelation function.

UNIT –III:  
**Linear Predictive Coding (LPC) Analysis:**

UNIT –IV:  
**Homomorphic Speech Processing:**

**Speech Enhancement:**

UNIT-V:  
**Automatic Speech & Speaker Recognition:**
Basic pattern recognition approaches, Parametric representation of speech, Evaluating the similarity of speech patterns, Isolated digit Recognition System, Continuous digit Recognition System

**Hidden Markov Model (HMM) for Speech:**
Hidden Markov Model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMS,
Speaker Recognition:
Recognition techniques, Features that distinguish speakers, Speaker Recognition Systems: Speaker Verification System, Speaker Identification System.

TEXT BOOKS:


REFERENCE BOOKS:

SOFT COMPUTING TECHNIQUES

(ELECTIVE -II)

UNIT –I:

Introduction:

Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, Knowledge representation - Expert systems.

UNIT –II:

Artificial Neural Networks:

Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron, Learning and Training the neural network, Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.

UNIT –III:

Fuzzy Logic System:

Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modeling and control schemes for nonlinear systems, Self-organizing fuzzy logic control, Fuzzy logic control for nonlinear time delay system.

UNIT –IV:

Genetic Algorithm:

Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search and AND-colony search techniques for solving optimization problems.

UNIT –V:

Applications:

TEXT BOOKS:


REFERENCE BOOKS:

OBJECT ORIENTED PROGRAMMING
(ELECTIVE - II)

Objective: Implementing programs for user interface and application development using core java principles

UNIT I:
Objective: Focus on object oriented concepts and java program structure and its installation

Introduction to OOP
Introduction, Need of Object Oriented Programming, Principles of Object Oriented Languages, Procedural languages Vs OOP, Applications of OOP, History of JAVA, Java Virtual Machine, Java Features, Installation of JDK1.6

UNIT II:
Objective: Comprehension of java programming constructs, control structures in Java

Programming Constructs
Variables, Primitive Datatypes, Identifiers- Naming Conventions, Keywords, Literals, Operators-Binary, Unary and ternary, Expressions, Precedence rules and Associativity, Primitive Type Conversion and Casting, Flow of control-Branching, Conditional, loops.

Classes and Objects- classes, Objects, Creating Objects, Methods, constructors- Constructor overloading, Garbage collector, Class variable and Methods- Static keyword, this keyword, Arrays, Command line arguments

UNIT III:
Objective: Implementing Object oriented constructs such as various class hierarchies, interfaces and exception handling

Inheritance: Types of Inheritance, Deriving classes using extends keyword, Method overloading, super keyword, final keyword, Abstract class

Interfaces, Packages and Enumeration: Interface-Extending interface, Interface Vs Abstract classes, Packages-Creating packages, using Packages, Access protection, java.lang package

Exceptions & Assertions - Introduction, Exception handling techniques-try...catch, throw, throws, finally block, user defined exception, Assertions

UNIT IV:
Objective: Understanding of Thread concepts and I/O in Java

MultiThreading: java.lang.Thread, The main Thread, Creation of new threads, Thread priority, Multithreading, Syncronization, suspending and Resuming threads, Communication between Threads

Input/Output: reading and writing data, java.io package
UNIT V:
Objective: Being able to build dynamic user interfaces using applets and Event handling in java

Applets- Applet class, Applet structure, An Example Applet Program, Applet Life Cycle, paint(), update() and repaint()
Event Handling - Introduction, Event Delegation Model, java.awt.event Description, Event Listeners, Adapter classes, Inner classes

UNIT VI:
Objective: Understanding of various components of Java AWT and Swing and writing code snippets using them

Abstract Window Toolkit
Why AWT?, java.awt package, Components and Containers, Button, Label, Checkbox, Radio buttons, List boxes, Choice boxes, Text field and Text area, container classes, Layouts, Menu, Scroll bar
Swing:
Introduction , JFrame, JApplet, JPanel, Components in swings, Layout Managers, JList and JScroll Pane, Split Pane, JTabbedPane, Dialog Box

Text Books:
1. The Complete Refernce Java, 8ed, Herbert Schildt, TMH
3. JAVA for Beginners, 4e, Joyce Farrell, Ankit R. Bhavsar, Cengage Learning.
4. Object oriented programming with JAVA, Essentials and Applications, Raj Kumar Bhuuya, Selvi, Chu TMH
5. Introduction to Java rogramming, 7th ed, Y Daniel Liang, Pearson

Reference Books:
1. JAVA Programming, K.Rajkumar.Pearson
2. Core JAVA, Black Book, NageswaraRao, Wiley, Dream Tech
3. Core JAVA for Beginners, RashmiKanta Das, Vikas.
I Year I Semester

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Cyber Security
(ELECTIVE - II)
I Year I Semester

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SIGNAL PROCESSING LAB

Note:

G. Minimum of 10 Experiments have to be conducted
H. All Experiments may be Simulated using MATLAB and to be verified theoretically.

1. Basic Operations on Signals, Generation of Various Signals and finding its FFT.
2. Program to verify Decimation and Interpolation of a given Sequences.
3. Program to Convert CD data into DVD data
4. Generation of Dual Tone Multiple Frequency (DTMF) Signals
5. Plot the Periodogram of a Noisy Signal and estimate PSD using Periodogram and Modified Periodogram methods
6. Estimation of Power Spectrum using Bartlett and Welch methods
7. Verification of Autocorrelation Theorem
8. Parametric methods (Yule-Walker and Burg) of Power Spectrum Estimation
9. Estimation of data series using Nth order Forward Predictor and comparing to the Original Signal
10. Design of LPC filter using Levinson-Durbin Algorithm
11. Computation of Reflection Coefficients using Schur Algorithm
12. To study Finite Length Effects using Simulink
13. Design and verification of Matched filter
15. Design and Simulation of Notch Filter to remove 60Hz Hum/any unwanted frequency component of given Signal (Speech/ECG)
UNIT –I:

Introduction to Adaptive Systems:


UNIT –II:

Development of Adaptive Filter Theory & Searching the Performance surface:


Searching the performance surface – Methods & Ideas of Gradient Search methods - Gradient Searching Algorithm & its Solution - Stability & Rate of convergence - Learning Curves.

UNIT –III:

Steepest Descent Algorithms:

Gradient Search by Newton’s Method, Method of Steepest Descent, Comparison of Learning Curves.

UNIT –IV:

LMS Algorithm & Applications:


UNIT –V:

Kalman Filtering:

TEXT BOOKS:


REFERENCE BOOKS:

UNIT –I:
Fundamentals of Image Processing and Image Transforms:
Introduction, Image sampling, Quantization, Resolution, Image file formats, Elements of image processing system, Applications of Digital image processing
Introduction, Need for transform, image transforms, Fourier transform, 2 D Discrete Fourier transform and its transforms, Importance of phase, Walsh transform, Hadamard transform, Haar transform, slant transform Discrete cosine transform, KL transform, singular value decomposition, Radon transform, comparison of different image transforms.

UNIT –II:
Image Enhancement:
Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters.
Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.

Image Restoration:
Introduction to Image restoration, Image degradation, Types of image blur, Classification of image restoration techniques, Image restoration model, Linear and Nonlinear image restoration techniques, Blind deconvolution

UNIT –III:
Image Segmentation:
Introduction to image segmentation, Point, Line and Edge Detection, Region based segmentation., Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding, Edge based segmentation, Edge detection and linking, Hough transform, Active contour

Image Compression:

UNIT -IV:
Basic Steps of Video Processing:
UNIT –V:

2-D Motion Estimation:
Optical flow, General Methodologies, Pixel Based Motion Estimation, Block-Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.

TEXT BOOKS:

REFERENCE BOOKS:
I Year II Semester

DETECTION AND ESTIMATION THEORY

UNIT –I:
Random Processes:
Discrete Linear Models, Markov Sequences and Processes, Point Processes, and Gaussian Processes.

UNIT –II:
Detection Theory:
Basic Detection Problem, Maximum A posteriori Decision Rule, Minimum Probability of Error Classifier, Bayes Decision Rule, Multiple-Class Problem (Bayes) - minimum probability error with and without equal a priori probabilities, Neyman-Pearson Classifier, General Calculation of Probability of Error, General Gaussian Problem, Composite Hypotheses.

UNIT –III:
Linear Minimum Mean-Square Error Filtering:
Linear Minimum Mean Squared Error Estimators, Nonlinear Minimum Mean Squared Error Estimators. Innovations, Digital Wiener Filters with Stored Data, Real-time Digital Wiener Filters, Kalman Filters.

UNIT –IV:
Statistics:

UNIT –V:
Estimating the Parameters of Random Processes from Data:

TEXT BOOKS:
REFERENCE BOOKS:
3. Introduction to Statistical Signal Processing with Applications - Srinath, Rajasekaran, Viswanathan, 2003, PHI.
UNIT –I:  
**Introduction to Digital Signal Processing:**  
Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation.  
**Computational Accuracy in DSP Implementations:**  
Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT –II:  
**Architectures for Programmable DSP Devices:**  
Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT -III:  
**Programmable Digital Signal Processors:**  
Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline operation of TMS320C54XX Processors.

UNIT –IV:  
**Analog Devices Family of DSP Devices:**  

UNIT –V:  
**Interfacing Memory and I/O Peripherals to Programmable DSP Devices:**  
Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).
TEXT BOOKS:

REFERENCE BOOKS:
4. Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI
I Year II Semester

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COMPUTER VISION

(ELECTIVE – III)
UNIT-I: Introduction

An Embedded System-Definition, Examples, Current Technologies, Integration in system Design, Embedded system design flow, hardware design concepts, software development, processor in an embedded system and other hardware units, introduction to processor based embedded system design concepts.

UNIT-II: Embedded Hardware

Embedded hardware building blocks, Embedded Processors – ISA architecture models, Internal processor design, processor performance, Board Memory – ROM, RAM, Auxiliary Memory, Memory Management of External Memory, Board Memory and performance.

Embedded board Input / output – Serial versus Parallel I/O, interfacing the I/O components, I/O components and performance, Board buses – Bus arbitration and timing, Integrating the Bus with other board components, Bus performance.

UNIT-III: Embedded Software

Device drivers, Device Drivers for interrupt-Handling, Memory device drivers, On-board bus device drivers, Board I/O drivers, Explanation about above drivers with suitable examples.

Embedded operating systems – Multitasking and process Management, Memory Management, I/O and file system management, OS standards example – POSIX, OS performance guidelines, Board support packages, Middleware and Application Software – Middleware, Middleware examples, Application layer software examples.


Embedded system design and development lifecycle model, creating an embedded system architecture, introduction to embedded software development process and tools- Host and Target machines, linking and locating software, Getting embedded software into the target system, issues in Hardware-Software design and co-design.

Implementing the design-The main software utility tool, CAD and the hardware, Translation tools, Debugging tools, testing on host machine, simulators, Laboratory tools, System Boot-Up.
UNIT-V: Embedded System Design-Case Studies

Case studies- Processor design approach of an embedded system –Power PC Processor based and Micro Blaze Processor based Embedded system design on Xilinx platform-NiosII Processor based Embedded system design on Altera platform-Respective Processor architectures should be taken into consideration while designing an Embedded System.

TEXT BOOKS:


REFERENCE BOOKS:


BIOMEDICAL SIGNAL PROCESSING
(ELECTIVE – III)

UNIT -I:
Random Processes:
Stationary random process, Ergodicity, Power spectral density and autocorrelation function of random processes. Noise power spectral density analysis, Noise bandwidth and noise figure of systems.

UNIT -II:
Data Compression Techniques:
Lossy and Lossless data reduction Algorithms, ECG data compression using Turning point, AZTEC, CORTES, Huffman coding, vector quantisation, DICOM Standards

UNIT -III:
Cardiological Signal Processing:
Pre-processing, QRS Detection Methods, Rhythm analysis, Arrhythmia Detection Algorithms, Automated ECG Analysis, ECG Pattern Recognition.


UNIT -IV:

UNIT -V:
Neurological Signal Processing:
Modelling of EEG Signals, Detection of spikes and spindles Detection of Alpha, Beta and Gamma Waves, Auto Regressive (A.R.) modelling of seizure EEG, Sleep Stage analysis, Inverse Filtering, Least squares and polynomial modelling.

TEXT BOOKS:
REFERENCE BOOKS:

UNIT -I:
Internetworking Concepts:
Principles of Internetworking, Connectionless Internetworking, Application level Interconnections, Network level Interconnection, Properties of thee Internet, Internet Architecture, Wired LANS, Wireless LANs, Point-to-Point WANs, Switched WANs, Connecting Devices, TCP/IP Protocol Suite.

IP Address:
Classful Addressing: Introduction, Classful Addressing, Other Issues, Sub-netting and Super-netting
ARP and RARP: ARP, ARP Package, RARP.

UNIT -II:
Mobile IP: Addressing, Agents, Three Phases, Inefficiency in Mobile IP.

UNIT -III:
Unicast Routing Protocols (RIP, OSPF, and BGP): Intra and Inter-domain Routing, Distance Vector Routing, RIP, Link State Routing, OSPF, Path Vector Routing, BGP.
Multicasting and Multicast Routing Protocols: Unicast - Multicast- Broadcast, Multicast Applications, Multicast Routing, Multicast Link State Routing: MOSPF, Multicast Distance Vector: DVMRP.
UNIT -IV:
**Domain Name System (DNS):** Name Space, Domain Name Space, Distribution of Name Space, and DNS in the internet.

**Remote Login TELNET:** Concept, Network Virtual Terminal (NVT).

**File Transfer FTP and TFTP:** File Transfer Protocol (FTP).

**Electronic Mail:** SMTP and POP.

**Network Management-SNMP:** Concept, Management Components, World Wide Web- HTTP Architecture.

UNIT -V:
**Multimedia:**

**TEXT BOOKS:**
2. Internetworking with TCP/IP Comer 3rd edition PHI

**REFERENCE BOOKS:**
UNIT -I:
Introduction:

UNIT -II:
Detection of Radar Signals in Noise:

UNIT -III:
Waveform Selection [3, 2]:

UNIT -IV:
Pulse Compression in Radar Signals:
UNIT V:

Phase Coding Techniques:
Principles, Binary Phase Coding, Barker Codes, Maximal Length Sequences (MLS/LRS/PN), Block Diagram of a Phase Coded CW Radar.
Poly Phase Codes: Frank Codes, Costas Codes, Non-Linear FM Pulse Compression, Doppler Tolerant PC Waveforms – Short Pulse, Linear Period Modulation (LPM/HFM), Sidelobe Reduction for Phase Coded PC Signals.

TEXT BOOKS:

REFERENCE BOOKS:
UNIT -I:
The Cellular Concept-System Design Fundamentals:
Introduction, Frequency Reuse, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference, Power Control for Reducing interference, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Trunking and Grade of Service

UNIT –II:
Mobile Radio Propagation: Large-Scale Path Loss:

UNIT –III:
Mobile Radio Propagation: Small –Scale Fading and Multipath
Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke’s model for flat fading, spectral shape due to Doppler spread in Clarke’s model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.
UNIT -IV:

Equalization and Diversity

UNIT -V:

Wireless Networks
Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, HiperLan, WLL.

TEXT BOOKS:


REFERENCE BOOKS:

2. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
I Year II Semester

ADVANCED SIGNAL PROCESSING LAB

Note:

A. Minimum of 10 Experiments have to be conducted
B. All Simulations are be carried out using MATLAB/DSP Processors/Labview Software & DSP Kits

1. Study of various addressing modes of DSP using simple programming examples
2. Generation of waveforms using recursive/filter methods
3. Sampling of input signal and display
4. Implementation of Linear and Circular Convolution for sinusoidal signals
5. Framing & windowing of speech signal.
6. Finding voiced & unvoiced detection for each frame of speech signal.
7. IIR Filter implementation using probe points
8. Implementation of FIR filters on DSP processor
9. Loop back using DSK kit
10. Real time signal enhancement using Adaptive Filter.
11. Representation of different Q-formats using GEL function
12. Verification of Finite word length effects (Overflow, Coefficient Quantization, Scaling and Saturation mode in DSP processors)
13. Image enhancement using spatial & frequency domain
15. Extraction of frames from Video signal
ACADEMIC REGULATIONS & COURSE STRUCTURE

For

TELEMATICS
(Applicable for batches admitted from 2016-2017)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India
### I Semester

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**Total Credits** 20

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**Total Credits** 20
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ACADEMIC REGULATIONS & COURSE STRUCTURE

For

VLSI&ES, ES&VLSI, VLSID&ES
(Applicable for batches admitted from 2016-2017)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India
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<td>1. Advanced Operating Systems</td>
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<td>2. System on Chip Design</td>
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### II Semester

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### IV Semester

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DIGITAL SYSTEM DESIGN

UNIT-I: Minimization Procedures and CAMP Algorithm

Review on minimization of switching functions using tabular methods, k-map, QM algorithm, CAMP-I algorithm, Phase-I: Determination of Adjacencies, DA, CSC, SSMs and EPCs., CAMP-I algorithm, Phase-II: Passport checking, Determination of SPC, CAMP-II algorithm: Determination of solution cube, Cube based operations, determination of selected cubes are wholly within the given switching function or not, Introduction to cube based algorithms.

UNIT-II: PLA Design, PLA Minimization and Folding Algorithms

Introduction to PLDs, basic configurations and advantages of PLDs, PLA-Introduction, Block diagram of PLA, size of PLA, PLA design aspects, PLA minimization algorithm(IISc algorithm), PLA folding algorithm(COMPACT algorithm)-Illustration of algorithms with suitable examples.

UNIT -III: Design of Large Scale Digital Systems

Algorithmic state machinecharts-Introduction, Derivation of SM Charts, Realization of SM Chart, control implementation, control unit design, data processor design, ROM design, PAL design aspects, digital system design approaches using CPLDs, FPGAs and ASICs.

UNIT-IV: Fault Diagnosis in Combinational Circuits

Faults classes and models, fault diagnosis and testing, fault detection test, test generation, testing process, obtaining a minimal complete test set, circuit under test methods- Path sensitization method, Boolean difference method, properties of Boolean differences, Kohavi algorithm, faults in PLAs, DFT schemes, built in self-test.

UNIT-V: Fault Diagnosis in Sequential Circuits

Fault detection and location in sequential circuits, circuit test approach, initial state identification, Haming experiments, synchronizing experiments, machine identification, distinguishing experiment, adaptive distinguishing experiments.

TEXT BOOKS:

1. Logic Design Theory-N. N. Biswas, PHI
3. Digital system Design using PLDd-Lala

REFERENCE BOOKS:

UNIT-I:

**VLSI Technology**: Fundamentals and applications, IC production process, semiconductor processes, design rules and process parameters, layout techniques and process parameters.

**VLSI Design**: Electronic design automation concept, ASIC and FPGA design flows, SOC designs, design technologies: combinational design techniques, sequential design techniques, state machine logic design techniques and design issues.

UNIT-II:

**CMOS VLSI Design**: MOSTechnology and fabrication process of pMOS, nMOS, CMOS and BiCMOS technologies, comparison of different processes.

**Building Blocks of a VLSI circuit**: Computer architecture, memory architectures, communication interfaces, mixed signal interfaces.

**VLSI Design Issues**: Design process, design for testability, technology options, power calculations, package selection, clock mechanisms, mixed signal design.

UNIT-III:

Basic electrical properties of MOS and BiCMOS circuits, MOS and BiCMOS circuit design processes, Basic circuit concepts, scaling of MOS circuits-qualitative and quantitative analysis with proper illustrations and necessary derivations of expressions.

UNIT-IV:

**Subsystem Design and Layout**: Some architectural issues, switch logic, gate logic, examples of structured design (combinational logic), some clocked sequential circuits, other system considerations.

**Subsystem Design Processes**: Some general considerations and an illustration of design processes, design of an ALU subsystem.
UNIT-V:

Floor Planning: Introduction, Floor planning methods, off-chip connections.

Architecture Design: Introduction, Register-Transfer design, high-level synthesis, architectures for low power, architecture testing.

Chip Design: Introduction and design methodologies.

TEXT BOOKS:

REFERENCE BOOKS:
UNIT -I: MOS Devices and Modeling


UNIT -II: Analog CMOS Sub-Circuits

MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors- Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT -III: CMOS Amplifiers

Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

UNIT -IV: CMOS Operational Amplifiers


UNIT -V: Comparators

Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators.

TEXT BOOKS:


REFERENCE BOOKS:

3. CMOS: Circuit Design, Layout and Simulation- Baker, Li and Boyce, PHI.
UNIT-I:

Co-Design Issues

Co-Design Models, Architectures, Languages, A Generic Co-design Methodology.

Co-Synthesis Algorithms

Hardware software synthesis algorithms: hardware – software partitioning distributed system co-synthesis.

UNIT-II:

Prototyping and Emulation

Prototyping and emulation techniques, prototyping and emulation environments, future developments in emulation and prototyping architecture specialization techniques, system communication infrastructure

Target Architectures

Architecture Specialization techniques, System Communication infrastructure, Target Architecture and Application System classes, Architecture for control dominated systems (8051-Architectures for High performance control), Architecture for Data dominated systems (ADSP21060, TMS320C60), Mixed Systems.

UNIT-III:

Compilation Techniques and Tools for Embedded Processor Architectures

Modern embedded architectures, embedded software development needs, compilation technologies, practical consideration in a compiler development environment.

UNIT-IV:

Design Specification and Verification

Design, co-design, the co-design computational model, concurrency coordinating concurrent computations, interfacing components, design verification, implementation verification, verification tools, interface verification.
UNIT-V:

Languages for System-Level Specification and Design-I

System-level specification, design representation for system level synthesis, system level specification languages.

Languages for System-Level Specification and Design-II

Heterogeneous specifications and multi language co-simulation, the cosyma system and lycos system.

TEXT BOOKS:


REFERENCE BOOKS:

UNIT-I:  Programming Embedded Systems in C
Introduction, What is an embedded system, Which processor should you use, Which programming language should you use, Which operating system should you use, How do you develop embedded software, Conclusions

Introducing the 8051 Microcontroller Family
Introduction, What’s in a name, The external interface of the Standard 8051, Reset requirements, Clock frequency and performance, Memory issues, I/O pins, Timers, Interrupts, Serial interface, Power consumption, Conclusions

UNIT-II:  Reading Switches
Introduction, Basic techniques for reading from port pins, Example: Reading and writing bytes, Example: Reading and writing bits (simple version), Example: Reading and writing bits (generic version), The need for pull-up resistors, Dealing with switch bounce, Example: Reading switch inputs (basic code), Example: Counting goats, Conclusions

UNIT-III:  Adding Structure to the Code
Introduction, Object-oriented programming with C, The Project Header (MAIN.H), The Port Header (PORT.H), Example: Restructuring the ‘Hello Embedded World’ example, Example: Restructuring the goat-counting example, Further examples, Conclusions

UNIT-IV:  Meeting Real-Time Constraints
Introduction, Creating ‘hardware delays’ using Timer 0 and Timer 1, Example: Generating a precise 50 ms delay, Example: Creating a portable hardware delay, Why not use Timer 2?, The need for ‘timeout’ mechanisms, Creating loop timeouts, Example: Testing loop timeouts, Example: A more reliable switch interface, Creating hardware timeouts, Example: Testing a hardware timeout, Conclusions

UNIT-V:  Case Study-Intruder Alarm System
Introduction, The software architecture, Key software components used in this example, running the program, the software, Conclusions
TEXT BOOKS:


REFERENCE BOOKS:

1. PIC MCU C-An introduction to programming, The Microchip PIC in CCS C - Nigel Gardner.
I Year I Semester

CMOS DIGITAL IC DESIGN
(ELECTIVE -I)

UNIT-I: MOS Design

Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT-II: Combinational MOS Logic Circuits:

MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates, AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

UNIT-III: Sequential MOS Logic Circuits

Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

UNIT-IV: Dynamic Logic Circuits

Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

UNIT-V: Semiconductor Memories

Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory- NOR flash and NAND flash.

TEXT BOOKS:


REFERENCE BOOKS:

I Year I Semester

SOFT COMPUTING TECHNIQUES

(ELECTIVE -I)

UNIT –I:
Introduction:
Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, Knowledge representation - Expert systems.

UNIT –II:
Artificial Neural Networks:
Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron, Learning and Training the neural network, Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.

UNIT –III:
Fuzzy Logic System:
Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modeling and control schemes for nonlinear systems, Self-organizing fuzzy logic control, Fuzzy logic control for nonlinear time delay system.

UNIT –IV:
Genetic Algorithm:
Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search and Ant-colony search techniques for solving optimization problems.

UNIT –V:
Applications:
TEXT BOOKS:


REFERENCE BOOKS:

I Year I Semester

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CYBER SECURITY
(ELECTIVE -I)
UNIT-I: Introduction to Operating Systems

Overview of computer system hardware, Instruction execution, I/O function, Interrupts, Memory hierarchy, I/O Communication techniques, Operating system objectives and functions, Evaluation of operating System

UNIT-II: Introduction to UNIX and LINUX

Basic Commands & Command Arguments, Standard Input, Output, Input / Output Redirection, Filters and Editors, Shells and Operations

UNIT –III:


Inter Process Communication: Introduction, File and record locking, Client – Server example, Pipes, FIFOs, Streams & Messages, Name Spaces, Systems V IPC, Message queues, Semaphores, Shared Memory, Sockets & TLI.

UNIT –IV:

Introduction to Distributed Systems:

Goals of distributed system, Hardware and software concepts, Design issues.

Communication in Distributed Systems:

Layered protocols, ATM networks, Client - Server model, Remote procedure call and Group communication.

UNIT –V:

Synchronization in Distributed Systems:

Clock synchronization, Mutual exclusion, E-tech algorithms, Bully algorithm, Ring algorithm, Atomic transactions

Deadlocks:

Dead lock in distributed systems, Distributed dead lock prevention and distributed dead lock detection.
TEXT BOOKS:

1. The Design of the UNIX Operating Systems – Maurice J. Bach, 1986, PHI.
2. Distributed Operating System - Andrew. S. Tanenbaum, 1994, PHI.

REFERENCE BOOKS:

I Year I Semester

SYSTEM ON CHIP DESIGN
(ELECTIVE-II)

UNIT-I: Introduction to the System Approach

UNIT-II: Processors

UNIT-III: Memory Design for SOC

UNIT-IV: Interconnect Customization and Configuration

UNIT-V: Application Studies / Case Studies
SOC Design approach, AES algorithms, Design and evaluation, Image compression – JPEG compression.

TEXT BOOKS:

REFERENCE BOOKS:

2. Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) – Jason Andrews – Newnes, BK and CDROM.
UNIT-I: Introduction

UNIT-II:
Modern Techniques:
Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operations.

Algorithms:

Conventional Encryption:
Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation.

Public Key Cryptography:
Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography.

UNIT-III:
Number Theory:
Prime and Relatively prime numbers, Modular arithmetic, Fermat’s and Euler’s theorems, Testing for primality, Euclid’s Algorithm, the Chinese remainder theorem, Discrete logarithms.

Message authentication and Hash Functions:
Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.
UNIT-IV:
Hash and Mac Algorithms: MD File, Message digest Algorithm, Secure Hash Algorithm, RIPEMD-160, HMAC.


UNIT-V:


Intruders, Viruses and Worms: Intruders, Viruses and Related threats.

Fire Walls: Fire wall Design Principles, Trusted systems.

TEXT BOOKS:

REFERENCE BOOKS:
1. Principles of Network and Systems Administration, Mark Burgess, JohnWiev.
PART-A: VLSI Lab (Front-end Environment)

- The students are required to design the logic circuit to perform the following experiments using necessary simulator (Xilinx ISE Simulator/ Mentor Graphics Questa Simulator) to verify the logical /functional operation and to perform the analysis with appropriate synthesizer (Xilinx ISE Synthesizer/Mentor Graphics Precision RTL) and then verify the implemented logic with different hardware modules/kits (CPLD/FPGA kits).

- The students are required to acquire the knowledge in both the Platforms (Xilinx and Mentor graphics) by perform at least SIX experiments on each Platform.

List of Experiments:

1. Realization of Logic gates.
2. Parity Encoder.
3. Random Counter
4. Synchronous RAM.
5. ALU.
6. UART Model.
8. Traffic Light Controller using Sequential Logic circuits
10. Finite State Machine (FSM) based logic circuit.
PART-A: VLSI Lab (Back-end Environment)

- The students are required to design and implement the Layout of the following experiments of any FOUR using CMOS 130nm Technology with Mentor Graphics Tool.

**List of Experiments:**

1. Inverter Characteristics.
2. Full Adder.
3. RS-Latch, D-Latch and Clock Divider.
4. Synchronous Counter and Asynchronous Counter.
5. Static and Dynamic RAM.
6. ROM

**Lab Requirements:**


**Hardware:** Personal Computer with necessary peripherals, configuration and operating System and relevant VLSI (CPLD/FPGA) hardware Kits.
EMBEDDED SYSTEM DESIGN

UNIT-I: Introduction

An Embedded System-Definition, Examples, Current Technologies, Integration in system Design, Embedded system design flow, hardware design concepts, software development, processor in an embedded system and other hardware units, introduction to processor based embedded system design concepts.

UNIT-II: Embedded Hardware

Embedded hardware building blocks, Embedded Processors – ISA architecture models, Internal processor design, processor performance, Board Memory – ROM, RAM, Auxiliary Memory, Memory Management of External Memory, Board Memory and performance.

Embedded board Input / output – Serial versus Parallel I/O, interfacing the I/O components, I/O components and performance, Board buses – Bus arbitration and timing, Integrating the Bus with other board components, Bus performance.

UNIT-III: Embedded Software

Device drivers, Device Drivers for interrupt-Handling, Memory device drivers, On-board bus device drivers, Board I/O drivers, Explanation about above drivers with suitable examples.

Embedded operating systems – Multitasking and process Management, Memory Management, I/O and file system management, OS standards example – POSIX, OS performance guidelines, Board support packages, Middleware and Application Software – Middleware examples, Application layer software examples.


Embedded system design and development lifecycle model, creating an embedded system architecture, introduction to embedded software development process and tools- Host and Target machines, linking and locating software, Getting embedded software into the target system, issues in Hardware-Software design and co-design.

Implementing the design-The main software utility tool, CAD and the hardware, Translation tools, Debugging tools, testing on host machine, simulators, Laboratory tools, System Boot-Up.
UNIT-V: Embedded System Design-Case Studies

Case studies- Processor design approach of an embedded system –Power PC Processor based and Micro Blaze Processor based Embedded system design on Xilinx platform-NiosII Processor based Embedded system design on Altera platform-Respective Processor architectures should be taken into consideration while designing an Embedded System.

TEXT BOOKS:


REFERENCE BOOKS:


CMOS MIXED SIGNAL CIRCUIT DESIGN

UNIT-I: Switched Capacitor Circuits

Introduction to Switched Capacitor circuits- basic building blocks, Operation and Analysis, Non-ideal effects in switched capacitor circuits, Switched capacitor integrators first order filters, Switch sharing, biquad filters.

UNIT-II: Phased Lock Loop (PLL)

Basic PLL topology, Dynamics of simple PLL, Charge pump PLLs-Lock acquisition, Phase/Frequency detector and charge pump, Basic charge pump PLL, Non-ideal effects in PLLs-PFD/CP non-idealities, Jitter in PLLs, Delay locked loops, applications.

UNIT-III: Data Converter Fundamentals

DC and dynamic specifications, Quantization noise, Nyquist rate D/A converters- Decoder based converters, Binary-Scaled converters, Thermometer-code converters, Hybrid converters

UNIT-IV: Nyquist Rate A/D Converters


UNIT-V: Oversampling Converters

Noise shaping modulators, Decimating filters and interpolating filters, Higher order modulators, Delta sigma modulators with multibitquantizers, Delta sigma D/A

TEXT BOOKS:


REFERENCE BOOKS:

UNIT-I: Introduction

UNIT-II: RTOS Programming
Basic Functions and Types of RTOS for Embedded Systems, RTOS mCOS-II, RTOS Vx Works, Programming concepts of above RTOS with relevant Examples, Programming concepts of RTOS Windows CE, RTOS OSEK, RTOS Linux 2.6.x and RTOS RT Linux.

UNIT-III: Program Modeling – Case Studies
Case study of embedded system design and coding for an Automatic Chocolate Vending Machine (ACVM) Using Mucos RTOS, case study of digital camera hardware and software architecture, case study of coding for sending application layer byte streams on a TCP/IP Network Using RTOS Vx Works, Case Study of Embedded System for an Adaptive Cruise Control (ACC) System in Car, Case Study of Embedded System for a Smart Card, Case Study of Embedded System of Mobile Phone Software for Key Inputs.

UNIT-IV: Target Image Creation & Programming in Linux

UNIT-V: Programming in RT Linux
Overview of RT Linux, Core RT Linux API, Program to display a message periodically, semaphore management, Mutex, Management, Case Study of Appliance Control by RT Linux System.
TEXT BOOKS:


REFERENCES:

UNIT-I: Introduction to Testing


UNIT-II: Logic and Fault Simulation


UNIT-III: Testability Measures

SCOAP Controllability and Observability, High Level Testability Measures, Digital DFT and Scan Design: Ad-Hoc DFT Methods, Scan Design, Partial-Scan Design, Variations of Scan.

UNIT-IV: Built-In Self-Test

The Economic Case for BIST, Random Logic BIST: Definitions, BIST Process, Pattern Generation, Response Compaction, Built-In Logic Block Observers, Test-Per-Clock, Test-Per-Scan BIST Systems, Circular Self Test Path System, Memory BIST, Delay Fault BIST.

UNIT-V: Boundary Scan Standard

Motivation, System Configuration with Boundary Scan: TAP Controller and Port, Boundary Scan Test Instructions, Pin Constraints of the Standard, Boundary Scan Description Language: BDSDL Description Components, Pin Descriptions.

TEXT BOOKS:


REFERENCE BOOKS:

UNIT-I:

**Introduction to Digital Signal Processing**
Introduction, a Digital signal-processing system, the sampling process, discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation.

**Computational Accuracy in DSP Implementations**
Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT-II:

**Architectures for Programmable DSP Devices**
Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT-III:

**Programmable Digital Signal Processors**
Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX Instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX Processors, Pipeline Operation of TMS320C54XX Processors.

UNIT-IV:

**Analog Devices Family of DSP Devices**

Introduction to Black fin Processor - The Black fin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.
UNIT-V:

Interfacing Memory and I/O Peripherals to Programmable DSP Devices

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

TEXT BOOKS:


REFERENCE BOOKS:

3. Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI
LOW POWER VLSI DESIGN
(ELECTIVE -III)

UNIT-I: Fundamentals of Low Power VLSI Design

UNIT-II: Low-Power Design Approaches
Switched Capacitance Minimization Approaches
System Level Measures, Circuit Level Measures, Mask level Measures.

UNIT-III: Low-Voltage Low-Power Adders

UNIT-IV: Low-Voltage Low-Power Multipliers
Introduction, Overview of Multiplication, Types of Multiplier Architectures, Braun Multiplier, Baugh-Wooley Multiplier, Booth Multiplier, Introduction to Wallace Tree Multiplier.

UNIT-V: Low-Voltage Low-Power Memories

TEXT BOOKS:
2. Low-Voltage, Low-Power VLSI Subsystems – Kiat-Seng Yeo, Kaushik Roy, TMH Professional Engineering.
REFERENCE BOOKS:

UNIT-I:

Introduction to DSP

Typical DSP algorithms, DSP algorithms benefits, Representation of DSP algorithms

Pipelining and Parallel Processing

Introduction, Pipelining of FIR Digital filters, Parallel Processing, Pipelining and Parallel Processing for Low Power

Retiming


UNIT-II:

Folding: Introduction -Folding Transform - Register minimization Techniques – Register minimization in folded architectures – folding of multirate systems


UNIT-III:

Systolic Architecture Design

Introduction – Systolic Array Design Methodology – FIR Systolic Arrays – Selection of Scheduling Vector – Matrix Multiplication and 2D Systolic Array Design – Systolic Design for Space Representations contain Delays

UNIT-IV:

Fast Convolution

Introduction – Cook-Toom Algorithm – Winogard algorithm – Iterated Convolution – Cyclic Convolution – Design of Fast Convolution algorithm by Inspection

UNIT-V:

Low Power Design

Scaling Vs Power Consumption –Power Analysis, Power Reduction techniques – Power Estimation Approaches

TEXT BOOKS:


REFERENCE BOOKS:

I Year II Semester

4 0 3

MICRO ELECTRO MECHANICAL SYSTEM (MEMS) DESIGN
(ELECTIVE-IV)

UNIT-I: Introduction
Basic structures of MEM devices – (Canti-Levers, Fixed Beams diaphragms). Broad Response of Micro electromechanical systems (MEMS) to Mechanical (Force, pressure etc.) Thermal, Electrical, optical and magnetic stimuli, compatibility of MEMS from the point of power dissipation, leakage etc.

UNIT-II: Review
Review of mechanical concepts like stress, strain, bending moment, deflection curve. Differential equations describing the deflection under concentrated force, Distributed force, distributed force, Deflection curves for canti-levers- fixed beam. Electrostatic excitation – columbic force between the fixed and moving electrodes. Deflection with voltage in C.L, Deflection Vs Voltage curve, critical fringe field – field calculations using Laplace equation. Discussion on the approximate solutions – Transient response of the MEMS.

UNIT-III: Types
Two terminal MEMS - capacitance Vs voltage Curve – Variable capacitor. Applications of variable capacitors. Two terminal MEM structures. Three terminal MEM structures – Controlled variable capacitors – MEM as a switch and possible applications.

UNIT-IV: MEM Circuits & Structures
MEM circuits & structures for simple GATES- AND, OR, NAND, NOR, Exclusive OR, simple MEM configurations for flip-flops triggering applications to counters, converters. Applications for analog circuits like frequency converters, wave shaping. RF Switches for modulation. MEM Transducers for pressure, force temperature. Optical MEMS.

UNIT-V: MEM Technologies
Silicon based MEMS- Process flow – Brief account of various processes and layers like fixed layer, moving layers spacers etc., and etching technologies. Metal Based MEMS: Thin and thick film technologies for MEMS. Process flow and description of the processes, Status of MEMS in the current electronics scenario.

TEXT BOOKS:

REFERENCE BOOKS:
I Year II Semester

CPLD AND FPGA ARCHITECTURES AND APPLICATIONS

(ELECTIVE -IV)

UNIT-I: Introduction to Programmable Logic Devices


UNIT-II: Field Programmable Gate Arrays

Organization of FPGAs, FPGA Programming Technologies, Programmable Logic Block Architectures, Programmable Interconnects, Programmable I/O blocks in FPGAs, Dedicated Specialized Components of FPGAs, Applications of FPGAs.

UNIT-III: SRAM Programmable FPGAs


UNIT -IV: Anti-Fuse Programmed FPGAs

Introduction, Programming Technology, Device Architecture, The Actel ACT1, ACT2 and ACT3 Architectures.

UNIT -V: Design Applications

General Design Issues, Counter Examples, A Fast Video Controller, A Position Tracker for a Robot Manipulator, A Fast DMA Controller, Designing Counters with ACT devices, Designing Adders and Accumulators with the ACT Architecture.

TEXT BOOKS:


REFERENCE BOOKS:

1. Field Programmable Gate Arrays - John V. Oldfield, Richard C. Dorf, Wiley India.
### I Year II Semester

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**SEMICONDUCTOR MEMORY DESIGN AND TESTING**

*(ELECTIVE-IV)*

#### UNIT-I: Random Access Memory Technologies

SRAM – SRAM Cell structures, MOS SRAM Architecture, MOS SRAM cell and peripheral circuit operation, Bipolar SRAM technologies, SOI technology, Advanced SRAM architectures and technologies, Application specific SRAMs, DRAM – DRAM technology development, CMOS DRAM, DRAM cell theory and advanced cell structures, BICMOS DRAM, soft error failure in DRAM, Advanced DRAM design and architecture, Application specific DRAM.

#### UNIT-II: Non-volatile Memories

Masked ROMs, High density ROM, PROM, Bipolar ROM, CMOS PROMS, EPROM, Floating gate EPROM cell, One time programmable EPROM, EEPROM, EEPROM technology and architecture, Non-volatile SRAM, Flash Memories (EPROM or EEPROM), advanced Flash memory architecture

#### UNIT-III: Memory Fault Modeling Testing and Memory Design for Testability and Fault Tolerance

RAM fault modeling, Electrical testing, Pseudo Random testing, Megabit DRAM Testing, non-volatile memory modeling and testing, IDDQ fault modeling and testing, Application specific memory testing, RAM fault modeling, BIST techniques for memory

#### UNIT-IV: Semiconductor Memory Reliability and Radiation Effects

General reliability issues RAM failure modes and mechanism, Non-volatile memory reliability, reliability modeling and failure rate prediction, Design for Reliability, Reliability Test Structures, Reliability Screening and qualification, Radiation effects, Single Event Phenomenon (SEP), Radiation Hardening techniques, Radiation Hardening Process and Design Issues, Radiation Hardened Memory characteristics, Radiation Hardness Assurance and Testing, Radiation Dosimetry, Water Level Radiation Testing and Test structures

#### UNIT-V: Advanced Memory Technologies and High-density Memory Packing Technologies

Ferroelectric RAMs (FRAMs), GaAs FRAMs, Analog memories, magneto resistive RAMs (MRAMs), Experimental memory devices, Memory Hybrids and MCMs (2D), Memory Stacks and MCMs (3D), Memory MCM testing and reliability issues, Memory cards, High Density Memory Packaging Future Directions.

**TEXT BOOKS:**

I Year II Semester

EMBEDDED SYSTEM DESIGN LABORATORY

- The Students are required to write the programs using C-Language according to the Experiment requirements using RTOS Library Functions and macros ARM-926 developer kits and ARM-Cortex.
- The following experiments are required to develop the algorithms, flow diagrams, source code and perform the compilation, execution and implement the same using necessary hardware kits for verification. The programs developed for the implementation should be at the level of an embedded system design.
- The students are required to perform at least SIX experiments from Part-I and TWO experiments from Part-II.

List of Experiments:

Part-I: Experiments using ARM-926 with PERFECT RTOS

1. Register a new command in CLI.
2. Create a new Task.
3. Interrupt handling.
4. Allocate resource using semaphores.
5. Share resource using MUTEX.
6. Avoid deadlock using BANKER’S algorithm.
7. Synchronize two identical threads using MONITOR.
8. Reader’s Writer’s Problem for concurrent Tasks.

Part-II Experiments on ARM-CORTEX processor using any open source RTOS.

(Coo-Cox-Software-Platform)

1. Implement the interfacing of display with the ARM-CORTEX processor.
2. Interface ADC and DAC ports with the Input and Output sensitive devices.
3. Simulate the temperature DATA Logger with the SERIAL communication with PC.
4. Implement the developer board as a modem for data communication using serial port communication between two PC’s.

Lab Requirements:

Software:

(v) Eclipse IDE for C and C++ (YAGARTO Eclipse IDE), Perfect RTOS Library, COO-COX Software Platform, YAGARTO TOOLS, and TFTP SERVER.
(vi)LINUX Environment for the compilation using Eclipse IDE & Java with latest version.
**Hardware:**

(v) The development kits of ARM-926 Developer Kits and ARM-Cortex Boards.

(vi) Serial Cables, Network Cables and recommended power supply for the board.
ACADEMIC REGULATIONS & COURSE STRUCTURE

For

VLSI, VLSID, VLSISD
(Applicable for batches admitted from 2016-2017)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India
### I Semester

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<td>2. Advanced Operating Systems</td>
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<td>3. Soft Computing Techniques</td>
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<td>1. CPLD and FPGA Architectures and Applications</td>
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<td>2. Advanced Computer Architecture</td>
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<td>3. Hardware Software Co-Design</td>
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<td>Low Power VLSI Design</td>
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<td>2. DSP Processors &amp; Architectures</td>
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<td>3. VLSI Signal Processing</td>
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## IV Semester

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UNIT-I: Minimization Procedures and CAMP Algorithm

Review on minimization of switching functions using tabular methods, k-map, QM algorithm, CAMP-I algorithm, Phase-I: Determination of Adjacencies, DA, CSC, SSMs and EPCs., CAMP-I algorithm, Phase-II: Passport checking, Determination of SPC, CAMP-II algorithm: Determination of solution cube, Cube based operations, determination of selected cubes are wholly within the given switching function or not, Introduction to cube based algorithms.

UNIT-II: PLA Design, PLA Minimization and Folding Algorithms

Introduction to PLDs, basic configurations and advantages of PLDs, PLA-Introduction, Block diagram of PLA, size of PLA, PLA design aspects, PLA minimization algorithm (IISc algorithm), PLA folding algorithm (COMPACT algorithm) - Illustration of algorithms with suitable examples.

UNIT-III: Design of Large Scale Digital Systems

Algorithmic state machine charts-Introduction, Derivation of SM Charts, Realization of SM Chart, control implementation, control unit design, data processor design, ROM design, PAL design aspects, digital system design approaches using CPLDs, FPGAs and ASICs.

UNIT-IV: Fault Diagnosis in Combinational Circuits

Faults classes and models, fault diagnosis and testing, fault detection test, test generation, testing process, obtaining a minimal complete test set, circuit under test methods- Path sensitization method, Boolean difference method, properties of Boolean differences, Kohavi algorithm, faults in PLAs, DFT schemes, built in self-test.

UNIT-V: Fault Diagnosis in Sequential Circuits

Fault detection and location in sequential circuits, circuit test approach, initial state identification, Hamming experiments, synchronizing experiments, machine identification, distinguishing experiment, adaptive distinguishing experiments.

TEXT BOOKS:

1. Logic Design Theory-N. N. Biswas, PHI
3. Digital system Design using PLDd-Lala

REFERENCE BOOKS:

UNIT-I:

**VLSI Technology**: Fundamentals and applications, IC production process, semiconductor processes, design rules and process parameters, layout techniques and process parameters.

**VLSI Design**: Electronic design automation concept, ASIC and FPGA design flows, SOC designs, design technologies: combinational design techniques, sequential design techniques, state machine logic design techniques and design issues.

UNIT-II:

**CMOS VLSI Design**: MOSTechnology and fabrication process of pMOS, nMOS, CMOS and BiCMOS technologies, comparison of different processes.

**Building Blocks of a VLSI circuit**: Computer architecture, memory architectures, communication interfaces, mixed signal interfaces.

**VLSI Design Issues**: Design process, design for testability, technology options, power calculations, package selection, clock mechanisms, mixed signal design.

UNIT-III:

Basic electrical properties of MOS and BiCMOS circuits, MOS and BiCMOS circuit design processes, Basic circuit concepts, scaling of MOS circuits-qualitative and quantitative analysis with proper illustrations and necessary derivations of expressions.

UNIT-IV:

**Subsystem Design and Layout**: Some architectural issues, switch logic, gate logic, examples of structured design (combinational logic), some clocked sequential circuits, other system considerations.

**Subsystem Design Processes**: Some general considerations and an illustration of design processes, design of an ALU subsystem.

UNIT-V:

**Floor Planning**: Introduction, Floor planning methods, off-chip connections.

**Architecture Design**: Introduction, Register-Transfer design, high-level synthesis, architectures for low power, architecture testing.

**Chip Design**: Introduction and design methodologies.
TEXT BOOKS:

REFERENCE BOOKS:
UNIT -I: MOS Devices and Modeling


UNIT -II: Analog CMOS Sub-Circuits

MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT -III: CMOS Amplifiers

Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

UNIT -IV: CMOS Operational Amplifiers


UNIT -V: Comparators

Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators.

TEXT BOOKS:


REFERENCE BOOKS:

3. CMOS: Circuit Design, Layout and Simulation- Baker, Li and Boyce, PHI.
UNIT-I: MOS Design

Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT-II: Combinational MOS Logic Circuits:

MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates, AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

UNIT-III: Sequential MOS Logic Circuits

Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

UNIT-IV: Dynamic Logic Circuits

Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

UNIT-V: Semiconductor Memories

Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory- NOR flash and NAND flash.

TEXT BOOKS:


REFERENCE BOOKS:

UNIT-I:

Digital Logic Design using VHDL

Introduction, designing with VHDL, design entry methods, logic synthesis, entities, architecture, packages and configurations, types of models: dataflow, behavioral, structural, signals vs. variables, generics, data types, concurrent vs. sequential statements, loops and program controls.

Digital Logic Design using Verilog HDL

Introduction, Verilog Data types and Operators, Binary data manipulation, Combinational and Sequential logic design, Structural Models of Combinational Logic, Logic Simulation, Design Verification and Test Methodology, Propagation Delay, Truth Table models using Verilog.

UNIT-II:

Combinational Logic Circuit Design using VHDL


Sequential Logic Circuit Design using VHDL

Flip-flops, registers & counters, synchronous sequential circuits: Basic design steps, Mealy State model, Design of FSM using CAD tools, Serial Adder Example, State Minimization, Design of Counter using sequential Circuit approach.

UNIT-III: Digital Logic Circuit Design Examples using Verilog HDL

Behavioral modeling, Data types, Boolean-Equation-Based behavioral models of combinational logics, Propagation delay and continuous assignments, latches and level-sensitive circuits in Verilog, Cyclic behavioral models of flip-flops and latches and Edge detection, comparison of styles for behavioral model; Behavioral model, Multiplexers, Encoders and Decoders, Counters, Shift Registers, Register files, Dataflow models of a linear feedback shift register, Machines with multi cycle operations, ASM and ASMD charts for behavioral modeling, Design examples, Keypad scanner and encoder.

UNIT-IV: Synthesis of Digital Logic Circuit Design

Introduction to Synthesis, Synthesis of combinational logic, Synthesis of sequential logic with latches and flip-flops, Synthesis of Explicit and Implicit State Machines, Registers and counters.
UNIT-V: Testing of Digital Logic Circuits and CAD Tools

Testing of logic circuits, fault model, complexity of a test set, path-sensitization, circuits with tree structure, random tests, testing of sequential circuits, built in self test, printed circuit boards, computer aided design tools, synthesis, physical design.

TEXT BOOKS:


REFERENCE BOOKS:


UNIT-I: Introduction to Operating Systems

Overview of computer system hardware, Instruction execution, I/O function, Interrupts, Memory hierarchy, I/O Communication techniques, Operating system objectives and functions, Evaluation of operating System

UNIT-II: Introduction to UNIX and LINUX

Basic Commands & Command Arguments, Standard Input, Output, Input / Output Redirection, Filters and Editors, Shells and Operations

UNIT –III:

System Calls:

System calls and related file structures, Input / Output, Process creation & termination.

Inter Process Communication:

Introduction, File and record locking, Client – Server example, Pipes, FIFOs, Streams & Messages, Name Spaces, Systems V IPC, Message queues, Semaphores, Shared Memory, Sockets & TLI.

UNIT –IV:

Introduction to Distributed Systems:

Goals of distributed system, Hardware and software concepts, Design issues.

Communication in Distributed Systems:

Layered protocols, ATM networks, Client - Server model, Remote procedure call and Group communication.

UNIT –V:

Synchronization in Distributed Systems:

Clock synchronization, Mutual exclusion, E-tech algorithms, Bully algorithm, Ring algorithm, Atomic transactions
Deadlocks:

Deadlock in distributed systems, Distributed dead lock prevention and distributed dead lock detection.

TEXT BOOKS:

1. The Design of the UNIX Operating Systems – Maurice J. Bach, 1986, PHI.
2. Distributed Operating System - Andrew. S. Tanenbaum, 1994, PHI.

REFERENCE BOOKS:

UNIT –I:

Introduction:

Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, Knowledge representation - Expert systems.

UNIT –II:

Artificial Neural Networks:

Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron, Learning and Training the neural network, Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.

UNIT –III:

Fuzzy Logic System:

Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modeling and control schemes for nonlinear systems, Self-organizing fuzzy logic control, Fuzzy logic control for nonlinear time delay system.

UNIT –IV:

Genetic Algorithm:

Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search and anD-colony search techniques for solving optimization problems.
UNIT –V:

Applications:


TEXT BOOKS:


REFERENCE BOOKS:

I Year I Semester

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CYBER SECURITY

(ELECTIVE – I)
CPLD AND FPGA ARCHITECTURES AND APPLICATIONS
(ELECTIVE – II)

UNIT-I: Introduction to Programmable Logic Devices


UNIT-II: Field Programmable Gate Arrays

Organization of FPGAs, FPGA Programming Technologies, Programmable Logic Block Architectures, Programmable Interconnects, Programmable I/O blocks in FPGAs, Dedicated Specialized Components of FPGAs, Applications of FPGAs.

UNIT -III: SRAM Programmable FPGAs


UNIT -IV: Anti-Fuse Programmed FPGAs

Introduction, Programming Technology, Device Architecture, TheActel ACT1, ACT2 and ACT3 Architectures.

UNIT -V: Design Applications

General Design Issues, Counter Examples, A Fast Video Controller, A Position Tracker for a Robot Manipulator, A Fast DMA Controller, Designing Counters with ACT devices, Designing Adders and Accumulators with the ACT Architecture.

TEXT BOOKS:

REFERENCE BOOKS:

1. Field Programmable Gate Arrays - John V. Oldfield, Richard C. Dorf, Wiley India.
ADVANCED COMPUTER ARCHITECTURE
(ELECTIVE-II)

UNIT-I: Fundamentals of Computer Design

Fundamentals of Computer design, Changing faces of computing and task of computer designer, Technology trends, Cost price and their trends, measuring and reporting performance, Quantitative principles of computer design, Amdahl’s law.

Instruction set principles and examples- Introduction, classifying instruction set- memory addressing- type and size of operands, Operations in the instruction set.

UNIT-II:

Pipelines

Introduction, basic RISC instruction set, Simple implementation of RISC instruction set, Classic five stage pipe lined RISC processor, Basic performance issues in pipelining, Pipeline hazards, Reducing pipeline branch penalties.

Memory Hierarchy Design


UNIT-III:

Instruction Level Parallelism (ILP)-The Hardware Approach

Instruction-Level parallelism, Dynamic scheduling, Dynamic scheduling using Tomasulo’s approach, Branch prediction, High performance instruction delivery- Hardware based speculation.

ILP Software Approach

Basic compiler level techniques, Static branch prediction, VLIW approach, Exploiting ILP, Parallelism at compile time, Cross cutting issues - Hardware verses Software.

UNIT-IV: Multi Processors and Thread Level Parallelism

Multi Processors and Thread level Parallelism- Introduction, Characteristics of application domain, Systematic shared memory architecture, Distributed shared – Memory architecture, Synchronization.
UNIT-V:  
**Inter Connection and Networks**

Introduction, Interconnection network media, Practical issues in interconnecting networks, Examples of inter connection, Cluster, Designing of clusters.

**Intel Architecture**

Intel IA-64 ILP in embedded and mobile markets Fallacies and pit falls.

**TEXT BOOKS:**


**REFERENCE BOOKS:**

UNIT-I:

Co-Design Issues

Co-Design Models, Architectures, Languages, A Generic Co-design Methodology.

Co-Synthesis Algorithms

Hardware software synthesis algorithms: hardware – software partitioning distributed system co-synthesis.

UNIT-II:

Prototyping and Emulation

Prototyping and emulation techniques, prototyping and emulation environments, future developments in emulation and prototyping architecture specialization techniques, system communication infrastructure

Target Architectures

Architecture Specialization techniques, System Communication infrastructure, Target Architecture and Application System classes, Architecture for control dominated systems (8051-Architectures for High performance control), Architecture for Data dominated systems (ADSP21060, TMS320C60), Mixed Systems.

UNIT-III:

Compilation Techniques and Tools for Embedded Processor Architectures

Modern embedded architectures, embedded software development needs, compilation technologies, practical consideration in a compiler development environment.

UNIT-IV:

Design Specification and Verification

Design, co-design, the co-design computational model, concurrency coordinating concurrent computations, interfacing components, design verification, implementation verification, verification tools, interface verification.
UNIT-V:

Languages for System-Level Specification and Design-I

System-level specification, design representation for system level synthesis, system level specification languages.

Languages for System-Level Specification and Design-II

Heterogeneous specifications and multi language co-simulation, the cosyma system and lycos system.

TEXT BOOKS:


REFERENCE BOOKS:

FRONT END VLSI DESIGN LABORATORY

- The students are required to design the logic circuit to perform the following experiments using necessary Industry standard simulator to verify the logical/functional operation, perform the analysis with appropriate synthesizer and to verify the implemented logic with different hardware modules/kits (CPLD/FPGA kits).

- The students are required to acquire the knowledge on any of the TWO different environmental platforms by perform at least FIVE experiments on each platform.

**List of Experiments:**

1. Realization of Logic gates.
2. Parity Encoder.
3. Random Counter
4. Single Port Synchronous RAM.
5. Synchronous FIFO.
6. ALU.
7. UART Model.
8. Dual Port Asynchronous RAM.
10. Traffic Light Controller using Sequential Logic circuits
12. Finite State Machine (FSM) based logic circuit.

**Lab Requirements:**

**Software:** Industrial standard software with prefectural licence consisting of required simulator, synthesizer, analyzer etc. in an appropriate integrated environment.

**Hardware:** Personal Computer with necessary peripherals, configuration and operating System and relevant VLSI (CPLD/FPGA) hardware Kits.
I Year II Semester

CMOS MIXED SIGNAL CIRCUIT DESIGN

UNIT-I: Switched Capacitor Circuits

Introduction to Switched Capacitor circuits- basic building blocks, Operation and Analysis, Non-ideal effects in switched capacitor circuits, Switched capacitor integrators first order filters, Switch sharing, biquad filters.

UNIT-II: Phased Lock Loop (PLL)

Basic PLL topology, Dynamics of simple PLL, Charge pump PLLs-Lock acquisition, Phase/Frequency detector and charge pump, Basic charge pump PLL, Non-ideal effects in PLLs-PFD/CP non-idealities, Jitter in PLLs, Delay locked loops, applications.

UNIT-III: Data Converter Fundamentals

DC and dynamic specifications, Quantization noise, Nyquist rate D/A converters- Decoder based converters, Binary-Scaled converters, Thermometer-code converters, Hybrid converters

UNIT-IV: Nyquist Rate A/D Converters


UNIT-V: Oversampling Converters

Noise shaping modulators, Decimating filters and interpolating filters, Higher order modulators, Delta sigma modulators with multibit quantizers, Delta sigma D/A

TEXT BOOKS:


REFERENCE BOOKS:

UNIT-I: Introduction

An Embedded System-Definition, Examples, Current Technologies, Integration in system Design, Embedded system design flow, hardware design concepts, software development, processor in an embedded system and other hardware units, introduction to processor based embedded system design concepts.

UNIT-II: Embedded Hardware

Embedded hardware building blocks, Embedded Processors – ISA architecture models, Internal processor design, processor performance, Board Memory – ROM, RAM, Auxiliary Memory, Memory Management of External Memory, Board Memory and performance.

Embedded board Input / output – Serial versus Parallel I/O, interfacing the I/O components, I/O components and performance, Board buses – Bus arbitration and timing, Integrating the Bus with other board components, Bus performance.

UNIT-III: Embedded Software

Device drivers, Device Drivers for interrupt-Handling, Memory device drivers, On-board bus device drivers, Board I/O drivers, Explanation about above drivers with suitable examples.

Embedded operating systems – Multitasking and process Management, Memory Management, I/O and file system management, OS standards example – POSIX, OS performance guidelines, Board support packages, Middleware and Application Software – Middleware, Middleware examples, Application layer software examples.


Embedded system design and development lifecycle model, creating an embedded system architecture, introduction to embedded software development process and tools- Host and Target machines, linking and locating software, Getting embedded software into the target system, issues in Hardware-Software design and co-design.

Implementing the design-The main software utility tool, CAD and the hardware, Translation tools, Debugging tools, testing on host machine, simulators, Laboratory tools, System Boot-Up.

UNIT-V: Embedded System Design-Case Studies

Case studies- Processor design approach of an embedded system –Power PC Processor based and Micro Blaze Processor based Embedded system design on Xilinx platform-NiosII Processor based Embedded system design on Altera platform-Respective Processor architectures should be taken into consideration while designing an Embedded System.
TEXT BOOKS:


REFERENCE BOOKS:


I Year II Semester

LOW POWER VLSI DESIGN

UNIT-I: Fundamentals of Low Power VLSI Design


UNIT-II: Low-Power Design Approaches


Switched Capacitance Minimization Approaches

System Level Measures, Circuit Level Measures, Mask level Measures.

UNIT-III: Low-Voltage Low-Power Adders


UNIT-IV: Low-Voltage Low-Power Multipliers

Introduction, Overview of Multiplication, Types of Multiplier Architectures, Braun Multiplier, Baugh-Wooley Multiplier, Booth Multiplier, Introduction to Wallace Tree Multiplier.

UNIT-V: Low-Voltage Low-Power Memories


TEXT BOOKS:

2. Low-Voltage, Low-Power VLSI Subsystems – Kiat-Seng Yeo, Kaushik Roy, TMH Professional Engineering.
REFERENCE BOOKS:

UNIT-I: Introduction to Testing


UNIT-II: Logic and Fault Simulation


UNIT-III: Testability Measures

SCOAP Controllability and Observability, High Level Testability Measures, Digital DFT and Scan Design: Ad-Hoc DFT Methods, Scan Design, Partial-Scan Design, Variations of Scan.

UNIT-IV: Built-In Self-Test

The Economic Case for BIST, Random Logic BIST: Definitions, BIST Process, Pattern Generation, Response Compaction, Built-In Logic Block Observers, Test-Per-Clock, Test-Per-Scan BIST Systems, Circular Self Test Path System, Memory BIST, Delay Fault BIST.

UNIT-V: Boundary Scan Standard

Motivation, System Configuration with Boundary Scan: TAP Controller and Port, Boundary Scan Test Instructions, Pin Constraints of the Standard, Boundary Scan Description Language: BDSL Description Components, Pin Descriptions.

TEXT BOOKS:


REFERENCE BOOKS:

UNIT-I: VLSI Physical Design Automation


UNIT-II: Partitioning, Floor Planning, Pin Assignment and Placement

Partitioning – Problem formulation, Classification of Partitioning algorithms, Kernighan-Lin Algorithm, Simulated Annealing, Floor Planning – Problem formulation, Classification of floor planning algorithms, constraint based floor planning, Rectangular Dualization, Pin Assignment – Problem formulation, Classification of pin assignment algorithms, General and channel Pin assignments, Placement – Problem formulation, Classification of placement algorithms, Partitioning based placement algorithms;

UNIT-III: Global Routing and Detailed Routing

Global Routing – Problem formulation, Classification of global routing algorithms, Maze routing algorithms, Detailed Routing – Problem formulation, Classification of routing algorithms, Single layer routing algorithms;

UNIT-IV: Physical Design Automation of FPGAs and MCMs

FPGA Technologies, Physical Design cycle for FPGAs, Partitioning, Routing – Routing Algorithm for the Non-Segmented model, Routing Algorithms for the Segmented Model;

Introduction to MCM Technologies, MCM Physical Design Cycle.

UNIT-V: Chip Input and Output Circuits

ESD Protection, Input Circuits, Output Circuits and $L \left( \frac{dI}{dt} \right)$ noise, On-chip clock Generation and Distribution, Latch-up and its prevention.

TEXT BOOKS:


REFERENCE BOOKS:

UNIT-I:

**Introduction to Digital Signal Processing**
Introduction, a Digital signal-processing system, the sampling process, discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation.

**Computational Accuracy in DSP Implementations**
Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT-II:

**Architectures for Programmable DSP Devices**
Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT-III:

**Programmable Digital Signal Processors**
Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX Instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX Processors, Pipeline Operation of TMS320C54XX Processors.

UNIT-IV:

**Analog Devices Family of DSP Devices**

Introduction to Black fin Processor - The Black fin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.
UNIT-V:

Interfacing Memory and I/O Peripherals to Programmable DSP Devices

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

TEXT BOOKS:


REFERENCE BOOKS:

3. Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI
UNIT-I:

Introduction to DSP
Typical DSP algorithms, DSP algorithms benefits, Representation of DSP algorithms

Pipelining and Parallel Processing
Introduction, Pipelining of FIR Digital filters, Parallel Processing, Pipelining and Parallel Processing for Low Power

Retiming

UNIT-II:

Folding: Introduction -Folding Transform - Register minimization Techniques – Register minimization in folded architectures – folding of multirate systems


UNIT-III:

Systolic Architecture Design
Introduction – Systolic Array Design Methodology – FIR Systolic Arrays – Selection of Scheduling Vector – Matrix Multiplication and 2D Systolic Array Design – Systolic Design for Space Representations contain Delays

UNIT-IV:

Fast Convolution
Introduction – Cook-Toom Algorithm – Winogard algorithm – Iterated Convolution – Cyclic Convolution – Design of Fast Convolution algorithm by Inspection

UNIT-V:

Low Power Design
Scaling Vs Power Consumption –Power Analysis, Power Reduction techniques – Power Estimation Approaches

TEXT BOOKS:


REFERENCE BOOKS:

UNIT-I: Introduction to the System Approach


UNIT-II: Processors


UNIT-III: Memory Design for SOC


UNIT-IV: Interconnect Customization and Configuration


UNIT-V: Application Studies / Case Studies

SOC Design approach, AES algorithms, Design and evaluation, Image compression – JPEG compression.
TEXT BOOKS:


REFERENCE BOOKS:

2. Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) – Jason Andrews – Newnes, BK and CDROM.
UNIT-I: **Statistical Modeling**
Modeling sources of variations, Monte Carlo techniques, Process variation modeling- Pelgrom’s model, Principle component based modeling, Quad tree based modeling, Performance modeling-Response surface methodology, delay modeling, interconnect delay models.

UNIT-II: **Statistical Performance, Power and Yield Analysis**
Statistical timing analysis, parameter space techniques, Bayesian networks Leakage models, High level statistical analysis, Gate level statistical analysis, dynamic power, leakage power, temperature and power supply variations, High level yield estimation and gate level yield estimation.

UNIT-III: **Convex Optimization**
Convex sets, convex functions, geometric programming, trade-off and sensitivity analysis, Generalized geometric programming, geometric programming applied to digital circuit gate sizing, Floor planning, wire sizing, Approximation and fitting- Monomial fitting, Maxmonomial fitting, Polynomial fitting.

UNIT-IV: **Genetic Algorithm**

UNIT-V: **GA Routing Procedures and Power Estimation**

**TEXT BOOKS / REFERENCE BOOKS:**
I Year II Semester

SEMICONDUCTOR MEMORY DESIGN AND TESTING
(ELECTIVE-IV)

UNIT-I: Random Access Memory Technologies
SRAM – SRAM Cell structures, MOS SRAM Architecture, MOS SRAM cell and peripheral

circuit operation, Bipolar SRAM technologies, SOI technology, Advanced SRAM architectures

and technologies, Application specific SRAMs, DRAM – DRAM technology development,

CMOS DRAM, DRAM cell theory and advanced cell structures, BICMOS DRAM, soft error

failure in DRAM, Advanced DRAM design and architecture, Application specific DRAM.

UNIT-II: Non-volatile Memories
Masked ROMs, High density ROM, PROM, Bipolar ROM, CMOS PROMS, EPROM, Floating
gate EPROM cell, One time programmable EPROM, EEPROM, EEPROM technology and

architecture, Non-volatile SRAM, Flash Memories (EPROM or EEPROM), advanced Flash

memory architecture

UNIT-III: Memory Fault Modeling Testing and Memory Design for Testability and

Fault Tolerance
RAM fault modeling, Electrical testing, Pseudo Random testing, Megabit DRAM Testing, non-

volatile memory modeling and testing, IDDO fault modeling and testing, Application specific

memory testing, RAM fault modeling, BIST techniques for memory

UNIT-IV: Semiconductor Memory Reliability and Radiation Effects
General reliability issues RAM failure modes and mechanism, Non-volatile memory reliability,

reliability modeling and failure rate prediction, Design for Reliability, Reliability Test Structures,

Reliability Screening and qualification, Radiation effects, Single Event Phenomenon (SEP),

Radiation Hardening techniques, Radiation Hardening Process and Design Issues, Radiation

Hardened Memory characteristics, Radiation Hardness Assurance and Testing, Radiation

Dosimetry, Water Level Radiation Testing and Test structures

UNIT-V: Advanced Memory Technologies and High-density Memory Packing

Technologies
Ferroelectric RAMs (FRAMs), GaAs FRAMs, Analog memories, magneto resistive RAMs

(MRAMs), Experimental memory devices, Memory Hybrids and MCMs (2D), Memory Stacks

and MCMs (3D), Memory MCM testing and reliability issues, Memory cards, High Density

Memory Packaging Future Directions.

TEXT BOOKS:
PART-A: VLSI Lab (Back-end Environment)

- The students are required to design and implement the Layout of the following experiments of any FIVE using CMOS 130nm Technology with appropriate Industrial standard software

List of Experiments:

10. Full Adder.
11. RS-Latch, D-Latch and Clock Divider.
12. Synchronous Counter and Asynchronous Counter.
13. Static RAM Cell.
15. ROM
17. Analog-to-Digital Converter.

PART-B: Mixed Signal Simulation

- The students are required to perform the following experimental concepts with suitable complexity of mixed-signal application based circuits of any FOUR (circuits consisting of both analog and digital parts) using necessary appropriate Industrial standard software

List of experimental Concepts:

- Analog circuit simulation.
- Digital circuit simulation.
- Mixed signal simulation.
- Layout Extraction.
- Parasitic values estimation from layout.
- Layout Vs Schematic.
- Net List Extraction.
- Design Rule Checks

Lab Requirements:

Software: Industrial standard software with prefectural licence consisting of required simulator, synthesizer, analyzer etc. in an appropriate integrated environment.

Hardware: Personal Computer with necessary peripherals, configuration and operating System and relevant VLSI (CPLD/FPGA) hardware kits if necessary.