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PAPER – II		Subject Code
S. No	**Subject**	
1	DIGITAL SYSTEM DESIGN	**1304101**
2	EMBEDDED REAL TIME OPERATING SYSTEMS	**1304102**
3	ADVANCED DIGITAL SIGNAL PROCESSING	**1304103**
4	DIGITAL DATA COMMUNICATIONS	**1304104**
5	INFORMATION THEORY AND CODING TECHNIQUES	**1304105**
6	DETECTION AND ESTIMATION THEORY	**1304106**
7	TRANSFORM TECHNIQUES	**1304107**
8	SPEECH PROCESSING	**1304108**
9	BIOMEDICAL SIGNAL PROCESSING	**1304109**
10	INTERNET PROTOCOLS	**1304110**
11	DIGITAL CONTROL SYSTEMS	**1304111**
12	DATA ACQUISITION SYSTEMS	**1304112**
13	PROCESS CONTROL INSTRUMENTATION	**1304113**
14	ADVANCED ANTENNA THEORY AND DESIGN	**1304114**
15	MICROWAVE INTEGRATED CIRCUITS	**1304115**
16	SMART ANTENNAS	**1304116**
17	LOW POWER VLSI DESIGN	**1304117**
18	CMOS ANALOG AND DIGITAL IC DESIGN	**1304118**
19	VLSI SIGNAL PROCESSING	**1304119**
20	SYSTEM ON CHIP DESIGN	**1304120**
21	DIGITAL DESIGN USING HDL	**1304121**
22	EMBEDDED C	**1304122**
23	HARDWARE SOFTWARE CO-DESIGN	**1304123**
24	MULTIMEDIA AND SIGNAL CODING	**1304124**
25	NETWORK SECURITY AND CRYPTOGRAPHY	**1304125**

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PAPER – III		Subject Code
S. No	**Subject**	
1	EMBEDDED SYSTEM DESIGN	**1304201**
2	VLSI TECHNOLOGY AND DESIGN	**1304202**
3	WIRELESS COMMUNICATIONS AND NETWORKS	**1304203**
4	IMAGE AND VIDEO PROCESSING	**1304204**
5	OPTICAL COMMUNICATION TECHNOLOGY	**1304205**
6	DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES	**1304206**
7	STATISTICAL SIGNAL PROCESSING	**1304207**
8	RADAR SIGNAL PROCESSING	**1304208**
9	PATTERN RECOGNITION PRINCIPLES	**1304209**
10	MOBILE COMPUTING TECHNOLOGIES	**1304210**
11	SOFT COMPUTING TECHNIQUES	**1304211**
12	CONTROL AND GUIDANCE SYSTEMS	**1304212**
13	FUZZY BASED CONTROL SYSTEMS	**1304213**
14	PHASED ARRAY SYSTEMS	**1304214**
15	MICROWAVE NETWORKS	**1304215**
16	RF CIRCUIT DESIGN	**1304216**
17	CAD FOR VLSI	**1304217**
18	CMOS MIXED SIGNAL CIRCUIT DESIGN	**1304218**
19	SEMICONDUCTOR MEMORY DESIGN AND TESTING	**1304219**
20	MICROCONTROLLERS FOR EMBEDDED SYSTEM DESIGN	**1304220**
21	DESIGN FOR TESTABILITY	**1304221**
22	EMBEDDED COMPUTING	**1304222**
23	CPLD AND FPGA ARCHITECURES AND APPLICATIONS	**1304223**
24	MICRO ELECTRO MECHANICAL SYSTEM DESIGN	**1304224**
25	TCP/IP AND ATM NETWORKS	**1304225**

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PAPER – II

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 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
2. Switching and Finite Automata Theory-Z. Kohavi , 2nd Edition, 2001, TMH
3. Digital system Design using PLDd-Lala

REFERENCE BOOKS:

1. Fundamentals of Logic Design – Charles H. Roth, 5th Ed., Cengage Learning.
2. Digital Systems Testing and Testable Design – Miron Abramovici, Melvin A. Breuer and Arthur D. Friedman- John Wiley & Sons Inc.

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Embedded Real Time Operating Systems

UNIT-I: Introduction
OS Services, Process Management, Timer Functions, Event Functions, Memory Management, Device, File and IO Systems Management, Interrupt Routines in RTOS Environment and Handling of Interrupt Source Calls, Real-Time Operating Systems, Basic Design Using an RTOS, RTOS Task Scheduling Models, Interrupt Latency and Response of the Tasks as Performance Metrics, OS Security Issues.

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
Off-The-Shelf Operating Systems, Operating System Software, Target Image Creation for Window XP Embedded, Porting RTOS on a Micro Controller based Development Board.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:

1. Dr. K.V.K.K. Prasad: “Embedded/Real-Time Systems” Dream Tech Publications, Black pad book.
2. Rajkamal: “Embedded Systems-Architecture, Programming and Design”, Tata McGraw Hill Publications, Second Edition, 2008.

REFERENCES:

1. Labrosse, “Embedding system building blocks “, CMP publishers.
2. Rob Williams,” Real time Systems Development”, Butterworth Heinemann Publications.

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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:
Design of Phase Shifters, Interfacing of Digital Systems with Different Sampling Rates, Implementation of Narrow Band Low Pass Filters, Implementation of Digital Filter Banks, Sub-band Coding of Speech Signals, Quadrature Mirror Filters, Trans-multiplexers, Over Sampling A/D and D/A Conversion.

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:
Parametric Methods of Power Spectrum Estimation: Autocorrelation & Its Properties, Relation between auto correlation & model parameters, AR Models - Yule-Walker & Burg Methods, MA & ARMA models for power spectrum estimation, Finite word length effect in IIR digital Filters – Finite word-length effects in FFT algorithms.

TEXT BOOKS:

1. Digital Signal Processing: Principles, Algorithms & Applications - J.G.Proakis & D. G. Manolakis, 4th Ed., PHI.
2. Discrete Time Signal Processing - Alan V Oppenheim & R. W Schaffer, PHI.
3. DSP – A Practical Approach – Emmanuel C. Ifeacher, Barrie. W. Jervis, 2 Ed., Pearson Education.

REFERENCE BOOKS:

1. Modern Spectral Estimation: Theory & Application – S. M .Kay, 1988, PHI.
2. Multi Rate Systems and Filter Banks – P.P.Vaidyanathan – Pearson Education.
3. Digital Signal Processing – S.Salivahanan, A.Vallavaraj, C.Gnanapriya, 2000,TMH
4. Digital Spectral Analysis – Jr. Marple

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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:

Data Communication Networks, Protocols and Standards, UART, USB, I2C, I2S, Line Configuration, Topology, Transmission Modes, Digital Data Transmission, DTE-DCE interface, Categories of Networks – TCP/IP Protocol suite and Comparison with OSI model.

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

Data Link Protocols: Asynchronous Protocols, Synchronous Protocols, Character Oriented Protocols, Bit-Oriented Protocol, Link Access Procedures.

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:

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

TEXT BOOKS:

1. Data Communication and Computer Networking - B. A.Forouzan, 2nd Ed., 2003, TMH.
2. Advanced Electronic Communication Systems - W. Tomasi, 5th Ed., 2008, PEI.

REFERENCE BOOKS:

1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
2. Data and Computer Communications - William Stallings, 8th Ed., 2007, PHI.
3. Data Communication and Tele Processing Systems -T. Housely, 2nd Ed, 2008, BSP.
4. Data Communications and Computer Networks- Brijendra Singh, 2nd Ed., 2005, PHI.

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Information Theory and Coding Techniques

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^m) 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

1. Lathi B. P., Modern Analog and Digital Communication Systems, Oxford Univ. Press
2. Shu Lin and Costello, Error Control Coding : Fundamentals and Applications, 2nd Edition, Pearson.
3. Sklar, Digital Communication, Pearson Education Asia.
4. Haykin Simon, Digital Communication, Wiley Publ.
5. Proakis, Digital Communication, McGraw Hill.
6. Schaum's Outline Series, Analog and Digital Communication, TMH.

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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:

Measurements, Nonparametric Estimators of Probability Distribution and Density Functions, Point Estimators of Parameters, Measures of the Quality of Estimators, Introduction to Interval Estimates, Distribution of Estimators, Tests of Hypotheses, Simple Linear Regression, Multiple Linear Regression.

UNIT –V:

Estimating the Parameters of Random Processes from Data:

Tests for Stationarity and Ergodicity, Model-free Estimation, Model-based Estimation of Autocorrelation Functions, Power Special Density Functions.

TEXT BOOKS:

1. Random Signals: Detection, Estimation and Data Analysis - K. Sam Shanmugan & A.M. Breipohl, Wiley India Pvt. Ltd, 2011.
2. Random Processes: Filtering, Estimation and Detection - Lonnie C. Ludeman, Wiley India Pvt. Ltd., 2010.

REFERENCE BOOKS:

1. Fundamentals of Statistical Signal Processing: Volume I Estimation Theory– Steven.M.Kay, Prentice Hall, USA, 1998.
2. Fundamentals of Statistical Signal Processing: Volume I Detection Theory– Steven.M.Kay, Prentice Hall, USA, 1998.
3. Introduction to Statistical Signal Processing with Applications - Srinath, Rajasekaran, Viswanathan, 2003, PHI.
4. Statistical Signal Processing: Detection, Estimation and Time Series Analysis – Louis L.Scharf, 1991, Addison Wesley.
5. Detection, Estimation and Modulation Theory: Part – I – Harry L. Van Trees, 2001, John Wiley & Sons, USA.
6. Signal Processing: Discrete Spectral Analysis – Detection & Estimation – Mischa Schwartz, Leonard Shaw, 1975, Mc Graw Hill.

TRANSFORM TECHNIQUES

UNIT -I:

Fourier Analysis:

Fourier series, Examples, Fourier Transform, Properties of Fourier Transform, Examples of Fourier transform, sampling theorem, Partial sum and Gibbs phenomenon, Fourier analysis of Discrete time Signals, Discrete Fourier Transform.

Time – Frequency Analysis: Window function, Short Time Fourier Transform, Discrete Short Time Fourier Transform, Continuous wavelet transform, Discrete wavelet transform, wavelet series, Interpretations of the Time-Frequency plot.

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:

1. A Wavelet Tour of Signal Processing theory and applications -Raghuveer M.Rao and Ajit S. Bopardikar, Pearson Edu, Asia, New Delhi, 2003.
2. K.P.Soman and K.I Ramachandran, " Insight into Wavelets – from theory to practice" PHI, Second edition,2008

REFERENCE BOOKS:

1. Fundamentals of Wavelets- Theory, Algorithms and Applications -Jaideva C Goswami, Andrew K Chan, John Wiley & Sons, Inc, Singapore, 1999.
2. Jaideva C.Goswami and Andrew K.Chan, " Fundamentals of Wavelets" Wiley publishers, 2006
3. A Wavelet Tour of Signal Processing-Stephen G. Mallat, Academic Press, 2 Ed
4. Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH,2009

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SPEECH PROCESSING

UNIT –I:

Fundamentals of Digital Speech Processing:

Anatomy & Physiology of Speech Organs, The process of Speech Production, Acoustic Phonetics, Articulatory Phonetics, The Acoustic Theory of Speech Production- Uniform lossless tube model, effect of losses in vocal tract, effect of radiation at lips, Digital models for speech signals.

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:

Basic principles of Linear Predictive Analysis: The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition Solution for Covariance Method, Durbin's Recursive Solution for the Autocorrelation Equations, Comparison between the Methods of Solution of the LPC Analysis Equations, Applications of LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

UNIT –IV:

Homomorphic Speech Processing:

Introduction, Homomorphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, The Complex Cepstrum of Speech, Pitch Detection, Formant Estimation, The Homomorphic Vocoder.

Speech Enhancement:

Nature of interfering sounds, Speech enhancement techniques: Single Microphone Approach : spectral subtraction, Enhancement by re-synthesis, Comb filter, Wiener filter, Multi microphone Approach.

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:

1. Digital Processing of Speech Signals - L.R. Rabiner and S. W. Schafer. Pearson Education.
2. Speech Communications: Human & Machine - Douglas O'Shaughnessy, 2nd Ed., Wiley India, 2000.
3. Digital Processing of Speech Signals. L.R Rabinar and R W Jhaung, 1978, Pearson Education.

REFERENCE BOOKS:

1. Discrete Time Speech Signal Processing: Principles and Practice - Thomas F. Quateri, 1st Ed., PE.
2. Speech & Audio Signal Processing- Ben Gold & Nelson Morgan, 1st Ed., Wiley.

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BIOMEDICAL SIGNAL PROCESSING

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.

Adaptive Noise Cancelling: Principles of Adaptive Noise Cancelling, Adaptive Noise Cancelling with the LMS Adaptation Algorithm, Noise Cancelling Method to Enhance ECG Monitoring, Fetal ECG Monitoring.

UNIT -IV:

Signal Averaging, Polishing: Mean and trend removal, Prony's method, Prony's Method based on the Least Squares Estimate, Linear prediction, Yule – Walker (Y –W) equations, Analysis of Evoked Potentials.

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:

1. Probability, Random Variables & Random Signal Principles – Peyton Z. Peebles, 4th Ed., 2009, TMH.
2. Biomedical Signal Processing- Principles and Techniques - D. C. Reddy, 2005, TMH.

REFERENCE BOOKS:

1. Digital Biosignal Processing - Weitkunat R, 1991, Elsevier.
2. Biomedical Signal Processing - Akay M , IEEE Press.
3. Biomedical Signal Processing -Vol. I Time & Frequency Analysis - Cohen.A, 1986, CRC Press.
4. Biomedical Digital Signal Processing: C-Language Experiments and Laboratory Experiments, Willis J. Tompkins, PHI.

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INTERNET PROTOCOLS

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

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).

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:

Digitizing Audio and Video, Network security, security in the internet firewalls. Audio and Video Compression, Streaming Stored Audio/Video, Streaming Live Audio/Video, Real-Time Interactive Audio/Video, RTP, RTCP, Voice Over IP. Network Security, Security in the Internet, Firewalls.

TEXT BOOKS:

1. TCP/IP Protocol Suite- Behrouz A. Forouzan, Third Edition, TMH
2. Internetworking with TCP/IP Comer 3 rd edition PHI

REFERENCE BOOKS:

1. High performance TCP/IP Networking- Mahbub Hassan, Raj Jain, PHI, 2005
2. Data Communications & Networking – B.A. Forouzan – 2nd Edition – TMH
3. High Speed Networks and Internets- William Stallings, Pearson Education, 2002.
4. Data and Computer Communications, William Stallings, 7th Edition., PEI.
5. The Internet and Its Protocols – Adrin Farrel, Elsevier, 2005.

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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:

Introduction, Linear difference equations, pulse response, Z – transforms, Theorems of Z – Transforms, the inverse Z – transforms, Modified 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:

Stability Analysis of closed loop systems in the Z-Plane, Jury stablility test – Stability Analysis by use of the Bilinear Transformation and Routh Stability criterion, Stability analysis using Liapunov theorems.

UNIT –IV:

Design of Discrete Time Control System by Conventional Methods:

Design of digital control based on the frequency response method – Bilinear Transformation and Design procedure in the W-plane, Lead, Lag and Lead-Lag compensators and digital PID controllers. Design digital control through deadbeat response method.

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, 2nd Edition.
2. M.Gopal - "Digital Control and State Variable Methods"- TMH

REFERENCE BOOKS:

1. Kuo - "Digital Control Systems"- Oxford University Press, 2nd Edition, 2003.
2. M. Gopal - "Digital Control Engineering".

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DATA ACQUISITION SYSTEMS

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

ANALOG TO DIGITAL CONVERTERS (ADCS): Classification of A/D converters.Parallel feed back – Successive approximation – Ramp comparison – Dual slope integration – Voltage to frequency – Voltage to Time – Logarithmic types of ADCS.

NON-LINEAR DATA CONVERTERS (NDC): Basic NDC configurations – Some common NDACS and NADCS – Programmable non-linear ADCS – NADC using optimal sized ROM – High speed hybrid NADC – PLS based NADC – Switched capacitor NDCS.

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:

1. Electronic data converters fundamentals and applications – Dinesh K. Anvekar, B.S. Sonde – Tata McGraw Hill.

REFERENCES:

1. Electronic Analog/ Digital conversions – Hermann Schmid – Tata McGraw Hill.
2. E.R. Hanateck, User's Handbook of D/A and A/D converters - Wiley
3. Electronic instrumentation by HS Kalsi- TMH 2 nd Edition, 2004.
4. Data converters by G.B. Clayton

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PROCESS CONTROL INSTRUMENTATION

UNIT-1
P & ID symbols. Process characteristics: Process load, Process lag, self-regulation.
Control system parameters: control lag, dead time, cycling.
Discontinuous controller modes: two position, multi position, floating control modes.
Continuous controller modes: Mathematical representation and description of P, I, D controller modes. Composite control modes: Mathematical representation and description of PI, PD, PID control modes. Response of control modes to linear, step and square wave error signals.

UNIT-2
Electronic Controller mode implementation: Designing of P, PI, PD, PID using OP-amplifiers.

UNIT-3
Pneumatic controller mode implementation: Implementation of P, PI, PD, PID using flapper – nozzle system.

UNIT-4
Final control: Actuators – Electrical & Pneumatic. Control Valves – Quick opening, linear and equal percentage control valves, valve sizing. I to P, P to I converters.

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:
1. Process control Instrumentation Technology by Curtis Johnson, 4 th Edition – PHI, Dec, 2000.
Reference Books:
1. Principles of Process control by D. Patranabis- TMH 2 nd Edition, 1996
2. P. Harriott, process control, Tata MoGraw – Hill publishing Co., Ltd., New Delhi, 1984.

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ADVANCED ANTENNA THEORY AND DESIGN

UNIT -I:

Antenna Theory:

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

UNIT -II:

Aperture Antenna:

Introduction, Pyramidal Horns- Design Procedure, Conical and Corrugated Horns, Aperture Corrugated Horns, Reflected Antennas- Parameters, Analysis of front-fed parabolic reflector, Feed methods and feed types, Cassegrain Reflector Horns.

UNIT -III:

Microstrip Radiators:

Introduction, Rectangular Microstrip Antenna analysis and Design, Circular Microstrip Antenna Analysis and Design,

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:

1. Constantine Balanis. A - 'Antenna Theory-Analysis and Design', 3rd Edition, John Wiley, 2005.
2. Bahl IJ, and Bhartia -NMicrostrip Antennas, Artech House, 1982.

REFERENCE BOOKS:

1. Microstrip Antenna Design Hand Book -Ramesh Garg, Prakash Bhatia, Architect House Inc. 2001.
2. Samuel Silve - Microwave Antenna - Theory and design, IEE Press, 1984.
3. James.J R. Hall, P S. Wood.C. - Micro strip Antenna-Theory and Design, PeterPeregrinu,1981.

MICROWAVE INTEGRATED CIRCUITS

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 couled microstrip 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:

1. Gupta KC and Amarjit Singh - Microwave Integrated circuits, Wiley Eastern, 1974.
2. Leo Young - Advances in Microwaves, Academic Press.

REFERENCE BOOKS:

1. Bharathi Bhat,and S.K. Koul -"Stripline-like Transmission Lines for Microwave Integrated Circuits, New Age International, 2007.

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SMART ANTENNAS

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 Beam former, Statistically Optimum Beamforming Weight Vectors, Maximum SNR Beam former, Multiple Sidelobe Canceller and Maximum, SINR Beam former, 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:

Overview, Antenna Design, Mutual Coupling, Adaptive Signal Processing Algorithms, DOA, Adaptive Beam forming, Beam forming and Diversity Combining for Rayleigh-Fading, Channel, Trellis-Coded Modulation (TCM) for Adaptive Arrays, Smart Antenna Systems for Mobile Ad Hoc Networks (MANETs), Protocol, Simulations, Discussion.

UNIT -V:

Space–Time Processing:

Introduction, Discrete Space–Time Channel and Signal Models, Space–Time Beamforming, Intersymbol and Co-Channel Suppression, Space–Time Processing for DS-CDMA, Capacity and Data Rates in MIMO Systems, Discussion.

TEXT BOOKS:

1. 'Introduction to Smart Antennas' - Constantine A. Balanis & Panayiotis I. Ioannides, Morgan & Claypool Publishers' series-2007
2. Joseph C. Liberti Jr., Theodore S Rappaport - "Smart Antennas for Wireless Communications IS-95 and Third Generation CDMA Applications", PTR – PH publishers, 1st Edition, 1989.

REFERENCE BOOKS:

1. T.S Rappaport - "Smart Antennas Adaptive Arrays Algorithms and Wireless Position Location", IEEE press 1998, PTR – PH publishers 1999.

Smart Antennas - Lal Chand Godara, CRC Press, LLC-2004.

LOW POWER VLSI DESIGN

UNIT-I: Fundamentals of Low Power VLSI Design

Need for Low Power Circuit Design, Sources of Power Dissipation – Switching Power Dissipation, Short Circuit Power Dissipation, Leakage Power Dissipation, Glitching Power Dissipation, Short Channel Effects –Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot Electron Effect.

UNIT-II: Low-Power Design Approaches

Low-Power Design through Voltage Scaling – VTCMOS circuits, MTCMOS circuits, Architectural Level Approach –Pipelining and Parallel Processing Approaches.

Switched Capacitance Minimization Approaches

System Level Measures, Circuit Level Measures, Mask level Measures.

UNIT-III: Low-Voltage Low-Power Adders

Introduction, Standard Adder Cells, CMOS Adder's Architectures – Ripple Carry Adders, Carry Look-Ahead Adders, Carry Select Adders, Carry Save Adders, Low-Voltage Low-Power Design Techniques –Trends of Technology and Power Supply Voltage, Low-Voltage Low-Power Logic Styles.

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

Basics of ROM, Low-Power ROM Technology, Future Trend and Development of ROMs, Basics of SRAM, Memory Cell, Precharge and Equalization Circuit, Low-Power SRAM Technologies, Basics of DRAM, Self-Refresh Circuit, Future Trend and Development of DRAM.

TEXT BOOKS:

1. CMOS Digital Integrated Circuits – Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 2011.
2. Low-Voltage, Low-Power VLSI Subsystems – Kiat-Seng Yeo, Kaushik Roy, TMH Professional Engineering.

REFERENCE BOOKS:

1. Low Power CMOS Design – AnanthaChandrakasan, IEEE Press/Wiley International, 1998.
2. Low Power CMOS VLSI Circuit Design – Kaushik Roy, Sharat C. Prasad, John Wiley & Sons, 2000.
3. Practical Low Power Digital VLSI Design – Gary K. Yeap, Kluwer Academic Press, 2002.
4. Low Power CMOS VLSI Circuit Design – A. Bellamour, M. I. Elamasri, Kluwer Academic Press, 1995.

CMOS ANALOG AND DIGITAL IC DESIGN

UNIT-I:

MOS Devices and Modeling

The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modeling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

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:

1. Digital Integrated Circuit Design – Ken Martin, Oxford University Press, 2011.
2. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed., 2011.
3. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.
4. Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition, 2010.

REFERENCE BOOKS:

1. Analog Integrated Circuit Design- David A. Johns, Ken Martin, Wiley Student Edn, 2013.
2. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition.
3. CMOS: Circuit Design, Layout and Simulation- Baker, Li and Boyce, PHI.
4. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, 2nd Ed., PHI.

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VLSI SIGNAL PROCESSING

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

Introduction – Definitions and Properties – Solving System of Inequalities – Retiming Techniques

UNIT-II:

Folding: Introduction -Folding Transform - Register minimization Techniques – Register minimization in folded architectures – folding of multirate systems

Unfolding: Introduction – An Algorithm for Unfolding – Properties of Unfolding – critical Path, Unfolding and Retiming – Applications of Unfolding

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

Programmable DSP: Evaluation of Programmable Digital Signal Processors, DSP Processors for Mobile and Wireless Communications, Processors for Multimedia Signal Processing.

TEXT BOOKS:

1. VLSI Digital Signal Processing- System Design and Implementation – Keshab K. Parhi, 1998, Wiley Inter Science.
2. VLSI and Modern Signal Processing – Kung S. Y, H. J. While House, T. Kailath, 1985, Prentice Hall.

REFERENCE BOOKS:

1. Design of Analog – Digital VLSI Circuits for Telecommunications and Signal Processing – Jose E. France, Yannis Tsividis, 1994, Prentice Hall.
2. VLSI Digital Signal Processing – Medisetti V. K, 1995, IEEE Press (NY), USA.

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SYSTEM ON CHIP DESIGN

UNIT-I: Introduction to the System Approach

System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, An approach for SOC Design, System Architecture and Complexity.

UNIT-II: Processors

Introduction , Processor Selection for SOC, Basic concepts in Processor Architecture, Basic concepts in Processor Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

UNIT-III: Memory Design for SOC

Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Types of Cache, Split – I, and D – Caches, Multilevel Caches, Virtual to real translation , SOC Memory System, Models of Simple Processor – memory interaction.

UNIT-IV: Interconnect Customization and Configuration

Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses , Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization: An overview, Customizing Instruction Processor, Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance- Specific design, Customizable Soft Processor, Reconfiguration - overhead analysis and trade-off analysis on reconfigurable Parallelism.

UNIT-V: Application Studies / Case Studies

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

TEXT BOOKS:

1. Computer System Design System-on-Chip - Michael J. Flynn and Wayne Luk, Wiely India Pvt. Ltd.
2. ARM System on Chip Architecture – Steve Furber –2nd Ed., 2000, Addison Wesley Professional.
3.

REFERENCE BOOKS:

1. Design of System on a Chip: Devices and Components – Ricardo Reis, 1st Ed., 2004, Springer
2. Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) – Jason Andrews – Newnes, BK and CDROM.
3. System on Chip Verification – Methodologies and Techniques –Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001, Kluwer Academic Publishers.

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DIGITAL DESIGN USING HDL

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

Combinational circuits building blocks: Multiplexers, Decoders , Encoders , Code converters, Arithmetic comparison circuits , VHDL for combinational circuits , Adders-Half Adder, Full Adder, Ripple-Carry Adder, Carry Look-Ahead Adder, Subtraction, Multiplication.

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:

1. Stephen Brown & Zvonko Vranesic, ”Fundamentals of Digital logic design with VHDL”, Tata McGraw Hill,2nd edition.
2. Michael D. Ciletti, “Advanced digital design with the Verilog HDL”, Eastern economy edition, PHI.

REFERENCE BOOKS:

1. Stephen Brown & Zvonko Vranesic, ”Fundamentals of Digital logic with Verilog design”, Tata McGraw Hill,2nd edition.
2. Bhaskar, ”VHDL Primer”,3rd Edition, PHI Publications.
3. Ian Grout, “Digital systems design with FPGAs and CPLDs”, Elsevier Publications.

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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:

1. Embedded C - Michael J. Pont, 2nd Ed., Pearson Education, 2008.

REFERENCE BOOKS:

1. PIC MCU C-An introduction to programming, The Microchip PIC in CCS C - Nigel Gardner.

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HARDWARE SOFTWARE CO-DESIGN

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:

1. Hardware / Software Co- Design Principles and Practice – Jorgen Staunstrup, Wayne Wolf – 2009, Springer.
2. Hardware / Software Co- Design - Giovanni De Micheli, Mariagiovanna Sami, 2002, Kluwer Academic Publishers.

REFERENCE BOOKS:

1. A Practical Introduction to Hardware/Software Co-design -Patrick R. Schaumont - 2010 – Springer Publications.

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MULTIMEDIA AND SIGNAL CODING

UNIT-I:
Introduction to Multimedia: Multimedia, World Wide Web, Overview of Multimedia Tools, Multimedia Authoring, Graphics/ Image Data Types, and File Formats.
Color in Image and Video: Color Science – Image Formation, Camera Systems, Gamma Correction, Color Matching Functions, CIE Chromaticity Diagram, Color Monitor Specifications, Outof- Gamut Colors, White Point Correction, XYZ to RGB Transform, Transform with Gamma Correction, L*A*B* Color Model. Color Models in Images – RGB Color Model for CRT Displays, Subtractive Color: CMY Color Model, Transformation from RGB to CMY, Under Color Removal: CMYK System, Printer Gamuts, Color Models in Video – Video Color Transforms, YUV Color Model, YIQ Color Model, Ycbcr Color Model.

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:
Audio Compression Techniques: ADPCM in Speech Coding, G.726 ADPCM, Vocoders – Phase Insensitivity, Channel Vocoder, Formant Vocoder, Linear Predictive Coding, CELP, Hybrid Excitation, Vocoders, MPEG Audio – MPEG Layers, MPEG Audio Strategy, MPEG Audio Compression Algorithms, MPEG-2 AAC, MPEG-4 Audio.

TEXT BOOKS:

1. Fundamentals of Multimedia – Ze- Nian Li, Mark S. Drew, PHI, 2010.
2. Multimedia Signals & Systems – Mrinal Kr. Mandal Springer International Edition 1st Edition, 2009

REFERENCE BOOKS:

1. Multimedia Communication Systems – Techniques, Stds& Netwroks K.R. Rao, Zorans. Bojkoric, Dragorad A.Milovanovic, 1st Edition, 2002.
2. Fundamentals of Multimedia Ze- Nian Li, Mark S.Drew, Pearson Education (LPE), 1st Edition, 2009.
3. Multimedia Systems John F. Koegel Bufond Pearson Education (LPE), 1st Edition, 2003.
4. Digital Video Processing – A. Murat Tekalp, PHI, 1996.
5. Video Processing and Communications – Yaowang, Jorn Ostermann, Ya-QinZhang, Pearson, 2002.

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NETWORK SECURITY AND CRYPTOGRAPHY

UNIT -I:

Introduction:

Attacks, Services and Mechanisms, Security attacks, Security services, A Model for Internetwork security. Classical Techniques: Conventional Encryption model, Steganography, Classical Encryption Techniques.

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:

Triple DES, International Data Encryption algorithm, Blowfish, RC5, CAST-128, RC2, Characteristics of Advanced Symmetric block cifers. **Conventional Encryption :** Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation.

UNIT -III:

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

MD File, Message digest Algorithm, Secure Hash Algorithm, RIPEMD-160, HMAC. Digital signatures and Authentication protocols: Digital signatures, Authentication Protocols, Digital signature standards.

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

UNIT –V:

IP Security:

Overview, Architecture, Authentication, Encapsulating Security Payload, Combining security Associations, Key Management. Web Security: Web Security requirements, Secure sockets layer and Transport layer security, Secure Electronic Transaction.

Intruders, Viruses and Worms

Intruders, Viruses and Related threats.

Fire Walls: Fire wall Design Principles, Trusted systems.

TEXT BOOKS:

1. Cryptography and Network Security: Principles and Practice - William Stallings, Pearson Education.
2. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.

REFERENCE BOOKS:

1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
2. Network Security - Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
3. Principles of Information Security, Whitman, Thomson.
4. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH
5. **Introduction to Cryptography, Buchmann, Springer.**

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PAPER – III

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 – Middle ware, Middleware examples, Application layer software examples.

UNIT-IV: Embedded System Design, Development, Implementation and Testing

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:

1. Tammy Noergaard "Embedded Systems Architecture: A Comprehensive Guide for Engineers and Programmers", Elsevier(Singapore) Pvt.Ltd.Publications, 2005.
2. Frank Vahid, Tony D. Givargis, "Embedded system Design: A Unified Hardware/Software Introduction", John Wily & Sons Inc.2002.

REFERENCE BOOKS:

1. Peter Marwedel, "Embedded System Design", Science Publishers, 2007.
2. Arnold S Burger, "Embedded System Design", CMP.
3. Rajkamal, "Embedded Systems: Architecture, Programming and Design", TMH Publications, Second Edition, 2008.

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VLSI TECHNOLOGY AND DESIGN

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: MOS Technology 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-qualitatitive 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:

1. Essentials of VLSI Circuits and Systems, K. Eshraghian, Douglas A. Pucknell, Sholeh Eshraghian, 2005, PHI Publications.
2. Modern VLSI Design-Wayne Wolf, 3rd Ed., 1997, Pearson Education.
3. VLSI Design-Dr.K.V.K.K.Prasad, Kattula Shyamala, Kogent Learning Solutions Inc., 2012.

REFERENCE BOOKS:

1. VLSI Design Technologies for Analog and Digital Circuits, Randall L.Geiger, Phillip E.Allen, Noel R.Strader, TMH Publications, 2010.
2. Introduction to VLSI Systems: A Logic, Circuit and System Perspective- Ming-BO Lin, CRC Press, 2011.
3. Principals of CMOS VLSI Design-N.H.E Weste, K. Eshraghian, 2nd Edition, Addison Wesley.

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WIRELESS COMMUNICATIONS AND NETWORKS

UNIT -I:

The Cellular Concept-System Design Fundamentals:

Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies-Prioritizing Handoffs, Practical Handoff Considerations, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference , Power Control for Reducing interference, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring .

UNIT –II:

Mobile Radio Propagation: Large-Scale Path Loss:

Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from prefect conductors, Ground Reflection (Two-Ray) Model, Diffraction-Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models- Longley-Ryce Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models-Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.

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

Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Non-linear Equalization-Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration-Selection 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, Comparision of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, Hiper Lan, WLL.

TEXT BOOKS:

1. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2nd Ed., 2002, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.

REFERENCE BOOKS:

1. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002, PE
2. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
3. Wireless Communication and Networking – William Stallings, 2003, PHI.
4. Wireless Communication – Upen Dalal, Oxford Univ. Press
5. Wireless Communications and Networking – Vijay K. Gary, Elsevier.

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IMAGE AND VIDEO PROCESSING

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:

Introduction, Need for image compression, Redundancy in images, Classification of redundancy in images, image compression scheme, Classification of image compression schemes, Fundamentals of information theory, Run length coding, Shannon – Fano coding, Huffman coding, Arithmetic coding, Predictive coding, Transformed based compression, Image compression standard, Wavelet-based image compression, JPEG Standards.

UNIT -IV:

Basic Steps of Video Processing:

Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, Filtering operations.

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:

1. Digital Image Processing – Gonzaleze and Woods, 3rd Ed., Pearson.
2. Video Processing and Communication – Yao Wang, Joem Ostermann and Ya–quin Zhang. 1st Ed., PH Int.
3. S.Jayaraman, S.Esakkirajan and T.VeeraKumar, “Digital Image processing, Tata Mc Graw Hill publishers, 2009

REFRENCE BOOKS:

1. Digital Image Processing and Analysis-Human and Computer Vision Application with CVIP Tools – Scotte Umbaugh, 2nd Ed, CRC Press, 2011.
2. Digital Video Processing – M. Tekalp, Prentice Hall International.
3. Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH, 2009.
4. Multidimentional Signal, Image and Video Processing and Coding – John Woods, 2nd Ed, Elsevier.
5. Digital Image Processing with MATLAB and Labview – Vipula Singh, Elsevier.
6. Video Demystified – A Hand Book for the Digital Engineer – Keith Jack, 5th Ed., Elsevier.

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ECE

OPTICAL COMMUNICATION TECHNOLOGY

UNIT –I:

Signal propagation in Optical Fibers:

Geometrical Optics approach and Wave Theory approach, Loss and Bandwidth, Chromatic Dispersion, Non Linear effects- Stimulated Brillouin and Stimulated Raman Scattering, Propagation in a Non-Linear Medium, Self-Phase Modulation and Cross Phase Modulation, Four Wave Mixing, Principle of Solitons.

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:

Signal formats for Modulation, Subcarrier Modulation and Multiplexing, Optical Modulations – Duobinary, Single Side Band and Multilevel Schemes, Ideal and Practical receivers for Demodulation, Bit Error Rates, Timing Recovery and Equalization, Reed-Solomon Codes for Error Detection and Correction.

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:

1. Optical Networks: A Practical Perspective - Rajiv Ramaswami and Kumar N. Sivarajan, 2nd Ed., 2004, Elsevier Morgan Kaufmann Publishers (An Imprint of Elsevier).
2. Optical Fiber Communications – Gerd Keiser, 3rd Ed., 2000, McGraw Hill.

REFERENCE BOOKS:

1. Optical Fiber Communications: Principles and Practice – John.M.Senior, 2nd Ed., 2000, PE.
2. Fiber Optics Communication – Harold Kolimbris, 2nd Ed., 2004, PEI
3. Optical Networks: Third Generation Transport Systems – Uyless Black, 2nd Ed., 2009, PEI
4. Optical Fiber Communications – Govind Agarwal, 2nd Ed., 2004, TMH.
5. Optical Fiber Communications and Its Applications – S.C.Gupta, 2004, PHI.

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DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES

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

Analog Devices Family of DSP Devices – ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance Processor.

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:

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. A Practical Approach To Digital Signal Processing - K Padmanabhan, R. Vijayarajeswaran, Ananthi. S, New Age International, 2006/2009
3. Embedded Signal Processing with the Micro Signal Architecture: Woon-Seng Gan, Sen M. Kuo, Wiley-IEEE Press, 2007

REFERENCE BOOKS:

1. Digital Signal Processors, Architecture, Programming and Applications-B. Venkataramani and M. Bhaskar, 2002, TMH.
2. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. 2000, S. Chand & Co.
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
4. *The Scientist and Engineer's Guide to Digital Signal Processing* by Steven W. Smith, Ph.D., California Technical Publishing, ISBN 0-9660176-3-3, 1997

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STATISTICAL SIGNAL PROCESSING

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, autocorreleation, cross-correlation,transfer functions, and coherence form finite signal samples.

UNIT III

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

Statistical parameter estimation: Maximum likehood 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:

1. Steven M.Kay, fundamentals of statistical signal processing: estimation Theory,Pretice-Hall,1993.
2. Monsoon H. Hayes, Stastical digital signal processing and modeling, USA, Wiley,1996.

Reference books:

1. Dimitris G.Manolakis, Vinay K. Ingle, and Stephen M. Kogon, Statistical and adaptive signal processing, Artech House, Inc,2005, ISBN 1580536107

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RADAR SIGNAL PROCESSING

UNIT -I:

Introduction:

Radar Block Diagram, Radar Equation, Information Available from Radar Echo. Review of Radar Range Performance– General Radar Range Equation, Radar Detection with Noise Jamming, Beacon and Repeater Equations, Bistatic Radar.

Matched Filter Receiver – Impulse Response, Frequency Response Characteristic and its Derivation, Matched Filter and Correlation Function, Correlation Detection and Cross-Correlation Receiver, Efficiency of Non-Matched Filters, Matched Filter for Non-White Noise.

UNIT -II:

Detection of Radar Signals in Noise:

Detection Criteria – Neyman-Pearson Observer, Likelihood-Ratio Receiver, Inverse Probability Receiver, Sequential Observer, Detectors – Envelope Detector, Logarithmic Detector, I/Q Detector. Automatic Detection - CFAR Receiver, Cell Averaging CFAR Receiver, CFAR Loss, CFAR Uses in Radar. Radar Signal Management – Schematics, Component Parts, Resources and Constraints.

UNIT -III:

Waveform Selection [3, 2]:

Radar Ambiguity Function and Ambiguity Diagram – Principles and Properties; Specific Cases – Ideal Case, Single Pulse of Sine Wave, Periodic Pulse Train, Single Linear FM Pulse, Noise Like Waveforms, Waveform Design Requirements, Optimum Waveforms for Detection in Clutter, Family of Radar Waveforms.

UNIT -IV:

Pulse Compression in Radar Signals:

Introduction, Significance, Types, Linear FM Pulse Compression – Block Diagram, Characteristics, Reduction of Time Side lobes, Stretch Techniques, Generation and Decoding of FM Waveforms – Block Schematic and Characteristics of Passive System, Digital Compression, SAW Pulse Compression.

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:

1. Radar Handbook - M.I. Skolnik, 2nd Ed., 1991, McGraw Hill.
2. Radar Design Principles : Signal Processing and The Environment - Fred E. Nathanson, 2nd Ed.,
   1999, PHI.
3. Introduction to Radar Systems - M.I. Skolnik, 3rd Ed., 2001, TMH.

REFERENCE BOOKS:

1. Radar Principles - Peyton Z. Peebles, Jr., 2004, John Wiley.
2. Radar Signal Processing and Adaptive Systems - R. Nitzberg, 1999, Artech House.
3. Radar Design Principles - F.E. Nathanson, 1st Ed., 1969, McGraw Hill.

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PATTERN RECOGNITION PRINCIPLES

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. Johnsonbaugh Jost, PHI.
2. Pattern Recognition Principle, Tou. Rafael. Gonzalez, Pea.
3. Pattern Classification, Richard duda, Hart., David Strok, Wiley.

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MOBILE COMPUTING TECHNOLOGIES

UNIT –I:

Introduction to Mobile Computing Architecture:

Mobile Computing – Dialog Control – Networks – Middleware and Gateways – Application and Services – Developing Mobile Computing Applications – Security in Mobile Computing – Architecture for Mobile Computing – Three Tier Architecture – Design considerations for Mobile Computing – Mobile Computing through Internet – Making existing Applications Mobile Enabled.

UNIT –II:

Cellular Technologies: GSM, GPS, GPRS, CDMA and 3G:

Bluetooth – Radio Frequency Identification – Wireless Broadband – Mobile IP – Internet Protocol Version 6 (IPv6) – Java Card – GSM Architecture – GSM Entities – Call Routing in GSM – PLMN Interfaces – GSM addresses and Identifiers – Network aspects in GSM – Authentication and Security – Mobile computing over SMS – GPRS and Packet Data Network – GPRS Network Architecture – GPRS Network Operations – Data Services in GPRS – Applications for GPRS – Limitations of GPRS – Spread Spectrum technology – Is-95 – CDMA Versus GSM – Wireless Data – Third Generation Networks – Applications on 3G

UNIT –III:

Wireless Application Protocol (WAP) and Wireless LAN:

WAP – MMS – Wireless LAN Advantages – IEEE 802.11 Standards – Wireless LAN Architecture – Mobility in 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:

Introduction – Moving beyond the Desktop – A Peek under the Hood: Hardware Overview – Mobile phones – PDA – Design Constraints in Applications for Handheld Devices – Palm OS architecture – Application Development – Multimedia – Symbian OS Architecture – Applications for Symbian, Different flavors of Windows CE -Windows CE Architecture

J2ME:

JAVA in the Handset – The Three-prong approach to JAVA Everywhere – JAVA 2 Micro Edition (J2ME) technology – Programming for CLDC – GUI in MIDP – UI Design Issues – Multimedia – Record Management System – Communication in MIDP – Security considerations in MIDP – Optional Packages

UNIT –V:

Voice Over Internet Protocol and Convergence:

Voice over IP- H.323 Framework for Voice over IP – Session Initiation Protocol – Comparision between H.323 and SIP – Real Time protocols – Convergence Technologies – Call Routing – Voice over IP Applications – IP multimedia subsystem (IMS) – Mobile VoIP

Security Issues in Mobile Computing:

Introduction – Information Security – Security Techniques and Algorithms – Security Protocols – Public Key Infrastructure – Trust – Security Models – Security frameworks for Mobile Environment

TEXT BOOKS:

1. Mobile Computing – Technology, Applications and Service Creation – Asoke K Talukder, Roopa R Yavagal, 2009, TATA McGraw Hill
2. Mobile Communications – Jochen Schiller – 2nd Edition – Pearson Education

REFERENCE BOOKS:

1. The CDMA 2000 System for Mobile Communications – Vieri Vaughi, Alexander Damn Jaonvic – Pearson
2. Adalestein - Fundamentals of Mobile & Parvasive Computing, 2008, TMH

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SOFT COMPUTING TECHNIQUES

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:

GA application to power system optimisation problem, Case studies: Identification and control of linear and nonlinear dynamic systems using MATLAB-Neural Network toolbox, Stability analysis of Neural-Network interconnection systems, Implementation of fuzzy logic controller using MATLAB fuzzy-logic toolbox, Stability analysis of fuzzy control systems.

TEXT BOOKS:

1. Introduction to Artificial Neural Systems - Jacek.M.Zurada, Jaico Publishing House, 1999.
2. Neural Networks and Fuzzy Systems - Kosko, B., Prentice-Hall of India Pvt. Ltd., 1994.

REFERENCE BOOKS:

1. Fuzzy Sets, Uncertainty and Information - Klir G.J. & Folger T.A., Prentice-Hall of India Pvt. Ltd., 1993.
2. Fuzzy Set Theory and Its Applications - Zimmerman H.J. Kluwer Academic Publishers, 1994.
3. Introduction to Fuzzy Control - Driankov, Hellendroon, Narosa Publishers.
4. Artificial Neural Networks - Dr. B. Yagananarayana, 1999, PHI, New Delhi.
5. Elements of Artificial Neural Networks - Kishan Mehrotra, Chelkuri K. Mohan, Sanjay Ranka, Penram International.
6. Artificial Neural Network –Simon Haykin, 2nd Ed., Pearson Education.
7. Introduction Neural Networks Using MATLAB 6.0 - S.N. Shivanandam, S. Sumati, S. N. Deepa,1/e, TMH, New Delhi.

CONTROL AND GUIDANCE SYSTEMS

Unit – I

The Accuracy of Target Trackers: Introduction, some objectives with feedback, some general concepts on accuracy, A tracker servo, Tracking accuracy in the absence of noise, The effect of thermal noise, The effect of other inputs and disturbances, A self optimising servo.

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: The effect of target and missile motion on missile "g" requirements, Types of LOS systems, Kinematic closure and stability of the guidance loop, The concept of feed forward terms, Phasing error and orientation difficulties, The effect of a digital computer inside guidance loop, Some numerical examples on the estimation of guidance accuracy, Some general conclusions on accuracy.

Unit – V

Homing Heads and Some Associated Stability Problems: Introduction, Homing head requirements, Some electro-mechanical arrangements, The effect of radome aberration, Isolated sight line and missile compensation.

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:

Guided Weapon Control Systems by P. Garnell, Brassey's Defence Publishers, New York.

Reference Book:

Guided Weapons by R.G. Lee et al., Brassey's Defence Publishers.

Fuzzy Based Control Systems

Unit -1

Introduction: Motivation, Fuzzy Systems, Fuzzy control from an industrial perspective, Uncertainty and Imprecision, Uncertainty in information, Chance Versus Ambiguity, The mathematics of fuzzy control.

Unit -II

Classical sets and fuzzy sets: Vagueness, Fuzzy set theory versus Probability theory, Operation and properties of classical and fuzzy sets. Classical relations and fuzzy relations: Cartesian Product, Crisp relations, Fuzzy relations, Operations on fuzzy relations, Various types of binary fuzzy relations, Fuzzy relation equations, The extension principle and its applications, Tolerance and equivalence relations, Crisp equivalence relation, Crisp tolerance relation, Fuzzy tolerance and equivalence relation, Value assignments.

Unit -III

Fuzzy logic and Approximate reasoning: Introduction, Linguistic variables, Fuzzy logic: Truth-values and truth tables in fuzzy logic, Fuzzy propositions. Approximate reasoning: Categorical, qualitative, syllogistic, dispositional reasoning, fuzzy If - then statements, Inference rules, The compositional rule of inference, representing a set of rule, Properties of a set of rule.

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

Adaptive fuzzy control: Introduction, Design and performance evaluation, the main approaches to design self-organizing controller, Model based controllers.

Neuro-fuzzy and fuzzy-neural control systems: Adaptive fuzzy systems, optimising the membership functions and the rule base of fuzzy logic controllers using neural networks, fuzzy transfer functions in neural networks, elements of evolutionary computation, case studies.

Reference Books

1. D. Drainkov, H. Hellendoorn and M. Reinfrank, An Introduction to Fuzzy Control, Narosa Publishing House, 1993.
2. T. J. Ross, Fuzzy Logic with Engineering Applications, McGraw Hill, Inc 1995.
3. H. J. Zimmermann, Fuzzy set theory and its applications, second edition, Allied Publishers limited, New Delhi, 1996.
4. T. Terano, K. Asai and M. Sugeno, Fuzzy systems theory and its application, Academic Press, 1992.

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ECE

PHASED ARRAY SYSTEMS

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:

1. Olliner, A.A, and G.H. Knittel - Phased Array Antennas, Artech House, 1972.
2. Kahrilas. PJ - Electronic Scanning Radar Systems Design Handbook, Artech House, 1976.

REFERENCE BOOKS:

1. Skolnik. MI- Radar Handbook, Mcgraw Hillso, NY,McGrow Hills-2007
2. Galati,G-(editor) - Advanced Radar Technique and Systems, Peter Peregrims Ltd, London, 1993.

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MICROWAVE NETWORKS

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, Directionl 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 chebshev 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:

1. Altmen JL -Microwave circuit, D van Nostrand Co.,Inc.,1964.
2. Collins. RE - Foundations for microwave engineering, John Wiley & Sons, inc 2^{nd} Edn, 2009.

REFERENCE BOOKS:

1. Ghosh.RN - Microwave Circuit Theory and Analysis, McGrew Hill.
2. Pozer.D M - Microwave Engineering, 2^{nd} Edn., John Wiley and Sons, Inc.,1999.

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RF CIRCUIT DESIGN

UNIT -I:

Introduction to RF Electronics:

The Electromagnetic Spectrum, units and Physical Constants, Microwave bands – RF behavior of Passive components: Tuned resonant circuits, Vectors, Inductors and Capacitors - Voltage and Current in capacitor circuits – Tuned RF / IF Transformers.

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:

Impedance matching using discrete components – Micro strip line matching networks, Amplifier classes of Operation and Biasing networks. **RF Passive & Active Components:** Filter Basics – Lumped filter design – Distributed Filter Design – Diplexer Filters- Crystal and Saw filters- Active Filters - Tunable filters – Power Combiners / Dividers – Directional Couplers – Hybrid Couplers – Isolators. RF Diodes – BJTs- FETs- HEMTs and Models.

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:

1. RF Circuit design: Theory and applications by Reinhold Ludwing, Pavel Bretchko. Pearson Education Asia Publication, New Delhi 2001.
2. Radio Frequency and Microwave Communication Circuits – Analysis and Design – Devendra K. Misra, Wiley Student Edition, John Wiley & Sons

REFERENCE BOOKS:

1. Radio frequency and Microwave Electronics - Mathew M.Radmangh, 2001, PE Asia Publ.
2. RF Circuit Design – Christopher Bowick, Cheryl Aljuni and John Biyler, Elsevier Science, 2008.
3. Secrets of RF Design - Joseph Carr., 3rd Edition, Tab Electronics.
4. Complete Wireless Design - Cotter W. Sawyer, 2nd Edition, Mc-Graw Hill.
5. Practical RF Circuit Design for Modem Wireless Systems Vol.2 -Less Besser and Rowan Gilmore.

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CAD FOR VLSI

UNIT-I: VLSI Physical Design Automation

VLSI Design Cycle, New Trends in VLSI Design Cycle, Physical Design Cycle, New Trends in Physical Design Cycle, Design Styles, System Packaging Styles;

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:

1. Algorithms for VLSI Physical Design Automation by Naveed Shervani, 3rd Edition, 2005, Springer International Edition.
2. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed., 2011.

REFERENCE BOOKS:

1. VLSI Physical Design Automation-Theory and Practice by Sadiq M Sait, Habib Youssef, World Scientific.
2. Algorithms for VLSI Design Automation, S. H. Gerez, 1999, Wiley student Edition, John Wiley and Sons (Asia) Pvt. Ltd.
3. VLSI Physical Design Automation by Sung Kyu Lim, Springer International Edition.

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

Successive approximation converters, Flash converter, Two-step A/D converters, Interpolating A/D converters, Folding A/D converters, Pipelined A/D converters, Time-interleaved 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:

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition, 2002
2. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.
3. Analog Integrated Circuit Design- David A. Johns,Ken Martin, Wiley Student Edition, 2013

REFERENCE BOOKS:

1. CMOS Integrated Analog-to- Digital and Digital-to-Analog converters-Rudy Van De Plassche, Kluwer Academic Publishers, 2003
2. Understanding Delta-Sigma Data converters-Richard Schreier, Wiley Interscience, 2005.
3. CMOS Mixed-Signal Circuit Design - R. Jacob Baker, Wiley Interscience, 2009.

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SEMICONDUCTOR MEMORY DESIGN AND TESTING

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.

Contd.,

TEXT BOOKS:

1. Semiconductor Memories Technology – Ashok K. Sharma, 2002, Wiley.
2. Advanced Semiconductor Memories – Architecture, Design and Applications - Ashok K. Sharma- 2002, Wiley.
3. Modern Semiconductor Devices for Integrated Circuits – Chenming C Hu, 1st Ed., Prentice Hall.

MICROCONTROLLERS FOR EMBEDDED SYSTEM DESIGN

UNIT-I: ARM Architecture

ARM Design Philosophy, Registers, PSR, Pipeline, Interrupts and Vector Table, Architecture Revision, ARM Processor Families.

UNIT-II: ARM Programming Model-I

Instruction Set: Data Processing Instructions, Branch, Load, Store Instructions, PSR Instructions, Conditional Instructions.

UNIT-III: ARM Programming Model-II

Thumb Instruction Set: Register Usage, Other Branch Instructions, Data Processing Instructions, Single-Register and Multi Register Load-Store Instructions, Stack, Software Interrupt Instructions

UNIT-IV : ARM Programming

Simple C Programs using Function Calls, Pointers, Structures, Integer and Floating Point Arithmetic, Assembly Code using Instruction Scheduling, Register Allocation, Conditional Execution and Loops.

UNIT-V: Memory Management

Cache Architecture, Polices, Flushing and Caches, MMU, Page Tables, Translation, Access Permissions, Content Switch.

TEXT BOOKS:

1. ARM Systems Developer's Guides- Designing & Optimizing System Software – Andrew N. Sloss, Dominic Symes, Chris Wright, 2008, Elsevier.

REFERENCE BOOKS:

1. Embedded Microcomputer Systems, Real Time Interfacing – Jonathan W. Valvano – Brookes / Cole, 1999, Thomas Learning.

DESIGN FOR TESTABILITY

UNIT-I: Introduction to Testing

Testing Philosophy, Role of Testing, Digital and Analog VLSI Testing, VLSI Technology Trends affecting Testing, Types of Testing, Fault Modeling: Defects, Errors and Faults, Functional Versus Structural Testing, Levels of Fault Models, Single Stuck-at Fault.

UNIT-II: Logic and Fault Simulation

Simulation for Design Verification and Test Evaluation, Modeling Circuits for Simulation, Algorithms for True-value Simulation, Algorithms for 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:

1. Essentials of Electronic Testing for Digital, Memory and Mixed Signal VLSI Circuits - M.L. Bushnell, V. D. Agrawal, Kluwer Academic Pulishers.

REFERENCE BOOKS:

1. Digital Systems and Testable Design - M. Abramovici, M.A.Breuer and A.D Friedman, Jaico Publishing House.
2. Digital Circuits Testing and Testability - P.K. Lala, Academic Press.

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EMBEDDED COMPUTING

UNIT-I:
Programming on Linux Platform:
System Calls, Scheduling, Memory Allocation, Timers, Embedded Linux, Root File System, Busy Box.
Operating System Overview: Processes, Tasks, Threads, Multi-Threading, Semaphore, Message Queue.

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:

1. Modern Embedded Computing - Peter Barry and Patrick Crowley, 1st Ed., Elsevier/Morgan Kaufmann, 2012.
2. Linux Application Development - Michael K. Johnson, Erik W. Troan, Adission Wesley, 1998.
3. Assembly Language for x86 Processors by Kip R. Irvine

REFERENCE BOOKS:

1. Operating System Concepts by Abraham Silberschatz, Peter B. Galvin and Greg Gagne.
2. Intel® 64 and IA-32 Architectures Software Developer Manuals
3. The Design of the UNIX Operating System by Maurice J. Bach Prentice-Hall
4. UNIX Network Programming by W. Richard Stevens.

CPLD AND FPGA ARCHITECURES AND APPLICATIONS

UNIT-I: Introduction to Programmable Logic Devices

Introduction, Simple Programmable Logic Devices – Read Only Memories, Programmable Logic Arrays, Programmable Array Logic, Programmable Logic Devices/Generic Array Logic; Complex Programmable Logic Devices – Architecture of Xilinx Cool Runner XCR3064XL CPLD, CPLD Implementation of a Parallel Adder with Accumulation.

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

Introduction, Programming Technology, Device Architecture, The Xilinx XC2000, XC3000 and XC4000 Architectures.

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:

1. Field Programmable Gate Array Technology - Stephen M. Trimberger, Springer International Edition.
2. Digital Systems Design - Charles H. Roth Jr, Lizy Kurian John, Cengage Learning.

REFERENCE BOOKS:

1. Field Programmable Gate Arrays - John V. Oldfield, Richard C. Dorf, Wiley India.
2. Digital Design Using Field Programmable Gate Arrays - Pak K. Chan/Samiha Mourad, Pearson Low Price Edition.
3. Digital Systems Design with FPGAs and CPLDs - Ian Grout, Elsevier, Newnes.
4. FPGA based System Design - Wayne Wolf, Prentice Hall Modern Semiconductor Design Series.

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MICRO ELECTRO MECHANICAL SYSTEM DESIGN

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:

1. MEMS Theory, Design and Technology - GABRIEL. M.Review, R.F.,2003, John wiley & Sons. .
2. Strength of Materials –Thimo Shenko, 2000, CBS publishers & Distributors.
3. MEMS and NEMS, Systems Devices; and Structures - Servey E.Lyshevski, 2002, CRC Press.

REFERENCE BOOKS:

1. Sensor Technology and Devices - Ristic L. (Ed) , 1994, Artech House, London.

TCP/IP AND ATM NETWORKS

UNIT –I:

Internet Protocol:

Internetworking, IPV4, IPV6, Transition from IPV4 to Ipv6.Process to process delivery, UDP, TCP and SCTP.

UNIT –II:

Congestion Control and Quality of Service:

Data traffic, congestion, congestion control, two examples, Quality of Service, Techniques to improve QOS, Integrated services, and Differentiated services.

Queue management:-Passive-Drop-tail, Drop front, Random drop, Active –Early Random drop, Random Early Detection.

UNIT –III:

Spread Spectrum:

Introduction, Basic Concept, Protection against Jamming, Spreading Codes (PN-Sequence), Generation, Properties, Types of Spread Spectrum Techniques, Application Of Spread Spectrum.

UNIT –IV:

X.25:- X.25 Layers, X.21 protocol,

Frame Relay:-Introduction, Frame relay Operation, Frame relay Layers, Congestion Control, Leaky Bucket algorithm.

ATM:-Design Goals, ATM Architecture, Switching, Switch Fabric, ATM Layers, Service Classes, ATM Application.

UNIT –V:

Interconnection Networks:

Introduction, Banyan Networks, Properties, Crossbar Switch, Three Stage Class Networks, Rearrangeble Networks, Folding Algorithm ,Benes Networks, Lopping Algorithm, Bit Allocation Algorithm.

SONET/SDH:-Synchronous Transport Signals, Physical Configuration, SONET Layers, SONET Frame.

TEXT BOOKS:

1. Data communication and Networking. -B.A. Forouzen, 4th Edition TMH
2. TCP/IP Protocol Suit - B.A. Forouzen, 4th Edition TMH

REFERENCE BOOKS:

1. Wireless Communication System -Abhishek yadav –University Sciences Press, 2009
2. Wireless Digital Communications -Kamilo Feher-1999 PHI
3. High Performance TCP-IP Networking -Mahaboob Hassan -Jain Raj-PHI
4. Data Communication & Networking -B. A. Forouzan 2nd Edition TMH
5. ATM Fundamentals – N.N.Biswas -Adveture book Publishers-1998.