ELECTRONICS AND COMMUNICATTIONS ENGINEERING

[SPECILISATION CODE: 08]

PAPER – I
(Choose Any ONE Subject)

S.NO	SUBJECT NAME	SUBJECT CODE
1.	ADAPTIVE SIGNAL PROCESSING	R50801
2.	ADVANCED COMMUNICATIONS	R50802
3.	ADVANCED OPERATING SYSTEMS	R50803
4.	CODING THEORY AND TECHNIQUES	R50804
5.	DIGITAL CONTROL SYSTEMS	R50805
6.	DIGITAL DATA COMMUNICATIONS	R50806
7.	DIGITAL SIGNAL PROCESSING	R50807
8.	DSP PROCESSORS AND ARCHITECTURES	R50808
9.	EMI-EMC	R50809
10.	HIGH SPEED NETWORKS	R50810
11.	NETWORK SECURITY AND CRYPROGRAPHY	R50811
12.	NEURAL NETWORKS AND APPLICATIONS	R50812
13.	REAL TIME OPERATING SYSTEMS	R50813
14.	SPEECH PROCESSING	R50814
15.	SYSTEM MODELLING & SIMULATION	R50815
16.	TRANSFORM TECHNIQUES	R50816
17.	VLSI DESIGN AND TECHNOLOGY	R50817
18.	TIME-HARMONIC ELECTROMAGNETIC FIELDS	R50818
19.	MICROWAVE ENGINEERING	R50819
20.	MICROWAVE CIRCUITS & MICROWAVE INTEGRATED CIRCUITS	R50820

ELECTRONICS AND COMMUNICATTIONS ENGINEERING

[SPECILISATION CODE: 08]

PAPER - II
(Choose Any ONE Subject)

PAPER	SUBJECT NAME	SUBJECT CODE
1	ADVANCED COMPUTER ARCHITECTURE & ORGANIZATION	R50851
2	ADVANCED DIGITAL SIGNAL PROCESSING	R50852
3	ALGORITHMS FOR VLSI DESIGN AUTOMATION	R50853
4	BIOMEDICAL SIGNAL PROCESSING	R50854
5	COMPUTER COMMUNICATIONS	R50855
6	COMPUTER NETWORKS & NETWORK PROTOCOLS	R50856
7	DESIGN OF FAULT TOLARENT SYSTEMS	R50857
8	DIGITAL SYSTEM DESIGN	R50858
9	IMAGE PROCESSING	R50859
10	LOW POWER VLSI DESIGN	R50860
12	MICRO-CONTROLLERS AND APPLICATIONS	R50861
13	MOBILE COMMUNICATION	R50862
14	OPTICAL COMMUNICATIONS AND NETWORKS	R50863
15	RADAR SIGNAL PROCESING	R50864
16	RELIABILITY ENGINEERING	R50865
17	STOCASTIC SIGNAL PROCESSING	R50866
18	VHDL PROGRAMMING	R50867
19	WIRELESS COMMUNICATIONS	R50868
20	MICROWAVE ANTENNAS	R50869
21	ELECTROMAGNETIC FIELD THEORY & MICROWAVE ANTENNAS	R50870

Subject Code : R 50801

ADAPTIVE SIGNAL PROCESSING

UNIT I:ADAPTIVE SYSTEMS : Definitions ,characteristics ,Applications, Example of an adaptive system. The adaptive linear combiner - Description, weight vectors Desired response performance function - gradient & mean square error .

UNIT II

APPROXIMATION TO THE DEVELOPMENT OF ADAPTIVE FILTER THEORY : Introduction to filtering - smoothing and prediction – linear optimum filtering , problem statement principle of Orthogonality - minimum – mean- square error - wiener- hopf equations, error performance - normal equation.

UNIT III

SEARCHING THE PERFORMANCE SURFACE – methods & ideas of gradient search methods - gradient searching algorithm & its solution - stability & rate of convergence - learning curves

UNIT IV

Gradient search by Newton's method - method of steepest descent ,comparison of learning curves

UNIT V

LMS ALGORITHM – Overview - LMS Adaptation algorithms, stability & performance analysis of LMS Algorithms - LMS gradient, & stochastic algorithms - convergence of LMS algorithm.

UNIT VI

APPLICATIONS: Noise cancellation - canceling echoes in long distance telephone circuits, adaptive beam forming.

UNIT VII

KALMAN FILTERING: Introduction - recursive mean square estimation random variables, statement of Kalman filtering problem – filtering - initial conditions - summary of kalman filtering

UNIT VIII

Variants of kalman filtering – extend kalman filtering Identification as a kalman filtering problem

TEXT BOOKS:

1.Bernard Widrow-Adaptive signal processing, PH Pearson Education, Asia.
2.Simon Haykin-Adaptive filter Theory, PH.

REFERENCES:

1.Sophocles.J.Orfamadis-optimum signal processing-An introduction,2nd Editon, MGH.
2.S.Thomas Alexander –Adaptive signal processing-Theory and applications, Springer –Verlag.

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Subject Code : R 50802

ADVANCED COMMUNICATION SYSTEMS

1. Review on fundaments of optical Communication Fiber Cable connectorization and testing splicing, connectors, design of Local area network installation-link

consideration-power budget and rise-time budget, local area network, cabling of l local area networks, testing troubleshooting and measurement.

2. Components of fiber optic networks, fiber optic networks-an overview, transceivers for fiber optic networks, semi conductor optical fibers. Erdium-doped fiber amplifiers.Passive components, switches and functional modules of fiber-optic networks-couplers/splitters, wavelength division multiplexers and demultiplexers, filters, isolators, circulators and attenuators. Optical switches and functional modules.

Fiber-optic measurement systems fixed sources-variable transmission medium system and variable sources-fixed transmission medium system-transmission medium general principles, geometry of coupling of detector to source, thermal detectors, photon detectors, two wavelength systems.

Review on satellite fundaments. Satellite link design: Design of down links, uplink design, design of satellite links for specified (C/N) Interference effects in complete link design.

Satellite Transponders : Function and implementation of transponder, transmission impairments.
Spread spectrum technique direct sequence spread spectrum techniques, DS-CDMA, FM-SS FH-SS CDMA, Synchronization and applications.

Encoding and forward error correction for digital satellite links, Error detection and correction, channel capacity, error detection coding, implementation of error detection on satellite links, echo controlling.
Earth station : transmissions, receivers, antennas, tracking system, terrestrial interface primary power test methods

Launching vehicles and propulsion: Introduction, principles of Rocket propulsion, power flight, injection into final orbit, Launch vehicles for commercial satellite.

BOOKS:

1. Fiber Optic Communications technology- DJaffer K. Mynbaev, Lowell L. Scheiner (Pearson education) Asia
2. Satellite Communication - Dr. D.C. Agarwal
3. Satellite communication systems and engineering Robert A. Nelson Wilbon L.Prichard Henui G. Suy derhoud.
4. Satellite Communication - Timothy Pratt, Charles W. Bostion.

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Subject Code : R 50803

ADVANCED OPERATING SYSTEMS

UNIT – I:

COMPUTER SYSTEM AND OPERATING SYSTEM OVERVIEW: Overview of Computer System hardware – Instruction execution – I/O function – Interrupts – Memory hierarchy – I.O Communication techniques. Operating System Objectives and functions – Evaluation of operating System – Example Systems.

UNIT – II:

INTRODUCTION TO DISTRIBUTED SYSTEMS : Goals of distributed system, hardware and software concepts, design issues.

COMMUNICATION IN DISTRIBUTED SYSTEMS : Layered protocols, ATM networks , the Client - Server model, remote procedure call and group communication.

UNIT-III:

SYNCHRONIZATION IN DISTRIBUTED SYSTEMS : Clock synchronization, Mutual exclusion, E-tech algorithms, the Bully algorithm, a ring algorithm, atomic transactions

UNIT – IV:

DEADLOCKS: dead lock in distributed systems, Distributed dead lock prevention, and distributed dead lock detection.

UNIT-V:

PROCESSES: Processes and Processors in distributed systems : Threads, system models, Processor allocation, Scheduling in distributed system, Fault tolerance and real time distributed systems.

UNIT-VI:

DISTRIBUTED FILE SYSTEMS : Distributed file systems design, distributed file system implementation, trends in distributed file systems.

UNIT – VII:

DISTRIBUTED SHARED MEMORY : What is shared memory, consistency models, page based distributed shared memory, shared variable distributed shared memory, object based DSM.

UNIT-VIII:

CASE STUDY MACH : Introduction to MACH, process management in MACH, memory management in MACH, communication in MACH, UNIX emulation in MACH. Case study DCE : Introduction to DCE threads, RPC's, Time service, Directory service, security service, Distributed file system.

TEXT BOOKS:

1. Distributed Operating System - Andrew. S. Tanenbaum, PHI
2. Operating Systems' – Internal and Design Principles Stallings, Fifth Edition–2005, Pearson education/PHI

REFERENCE BOOKS:

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7^{th} Edition, John Wiley.
2. Modern Operating Systems, Andrew S Tanenbaum 2^{nd} edition Pearson/PHI

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Subject Code : R 50804

CODING THEORY AND TECHNIQUES

1. Source Coding :

Mathematical models for information. A Logarithmic measure of information. Average mutual information and entropy, Information measures for continuous random variables. Coding for Discrete Sources: Coding for Discrete Memory less sources Discrete Stationary source, the Lempel – Ziv Algorithms.

Channel Coding :

2. Linear Block Codes:

Systematic linear codes and optimum decoding for the Binary Symmetric Channel, Generator and parity Check Matrices, Syndrome Decoding on Symmetric Channels, Hamming codes, Weight Enumerators and the Mac Williams Identities perfect Codes.

3. BCH codes :

Idempotents and Mattson – Solomon Polynomials, Reed – Solomon Codes, Justeen Codes, MDS Code, Alternate, Goppa and Generalized BCH Codes, Spectral Properties of Cyclic Codes.

4. Decoding of BDH Codes :

Berlekamp's Decoding Algorithm, Massey's minimum shift Register Synthesis Technique and its relation to Berlekamp 's Algorithm. A fast Belekamp – Massey Algorithm.

5. Convolution Codes :

Wozencraft's Sequential Decoding Algorithms, Fann's Algorithms and other Sequential Decoding Algorithms, Viterbi Decoding Algorithms.

BOOK :

1. Digital Communications by John D. Proakis (MH ---3rd edition.)
2. F.J. Mac Willians and N.J.A. Slone, The Theory of Error Correcting Codes, North Holland, 1977.
3. R.E. Balabut, Theory and Practice of Error Control Codes, Addison Wesley, 1983.

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Subject Code : R 50805

DIGITAL CONTROL SYSTEMS

UNIT-I

INTRODUCTION : Block diagram of typical digital control system – Advantages of sampling in control systems – Examples of discrete data and digital control systems – Data conversion and quantization – Sample and hold devices – D-A and A-D conversion – Sampling theorem – reconstruction of sampled signals – ZOH.

UNIT -II

Z – Transform: Definition and evaluation of Z-transforms – Mapping between s-plane and Z-plane-Inverse Z-transform – Theorems of the Z-transforms –Limitation of Z-transform – Pulse transfer function – Pulse transfer function of ZOH – Relation between G(s) and G (z) – Signal flow graph method applied to digital systems.

UNIT-III

State Space Analysis: State space modeling of digital systems with sample and hold – State transition equation of digital time in variant systems – Solution of time in variant discrete state equation by the Z-transformation – Transfer function from the state model – Eigen values – Eigen vectors and diagonalisation of the A-matrix – Jordan Canonical form – Computation of state transitions matrix – Transformation to phase variable canonical form – The state diagram – Decmoposition of digital system – Response of sample data system between sampling instants using state approach.

STABILITY: Definition of stability – Stability tests – The second method of Liapunov.

UNIT-IV

TIME DOMAIN ANALYSIS: Comparison of Time responses of continuous data and digital control systems – Correlation between time response and root locus in the s-plane and z-plane – Effect of Pole-zero configuration in the z-plane upon the maximum overshoot and peak time of transient response – Root loci for digital control systems – Steady state error analysis of digital control systems – Nyquist plot – Bode plot – G.M. and PM.

UNIT-V

CONTROLLABILITY AND OBSERVABILITY : Theorems on controllability – Theorems on Observability (Time invariant systems) Relation between controllability, observability and transfer function – Controllability and observability Vs sampling period.

UNIT-VI

DESIGN: The digital control design with digital controller with biliner transformation – Digital PID controller – Design with dead beat response – Pole placement through state feedback – Design of full order state observer – Discrete Euler Lagrance Equation – Discrete maximum principle.

UNIT-VII

DIGITAL STATE OBSERVER: Design of full order state observer and reduced state observer.

UNIT-VIII

DESIGN BY MAX. PRINCIPLE: Discrete Euler language equation – Discrete maximum principle.

TEXT BOOK:

1. Digital Control Systems – B.C. Kuo., H.S. International Edition.

REFRENCE BOOK:

1. Digital Control Systems – M. Gopal, TMH.

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DIGITAL DATA COMMUNICATIONS

UNIT – I: DIGITAL MODULATION TECHNIQUES
FSK, MSK, BPSK, QPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK Methods, Bandwidth efficiency, Carrier recovery, Clock recovery.

UNIT – II : DATA COMMUNICATION METHODS
Data Communication Circuit, point-to-point, Multi-point configurations and Topologies, transmission modes, 2-wire and 4-wire operations, Codes, Error detection methods, Error correction methods, Character synchronization.

UNIT – III: DATA COMMUNICATION PROTOCOLS:
Asynchronous protocols, Synchronous protocols, Bisync Protocol, SDLC, HDLC-Frame format, Flow control and error control,

UNIT – IV: SWITCHING TECHNIQUES:
Circuit Switching, Message Switching and Packet Switching principles, Virtual circuit and datagram techniques, X.25 and frame relay,

UNIT – V: LINE PROTOCALS AND CONGESTION CONTROL:
Line protocols: Basic mode, Half-duplex point-to-point protocol, Half-Duplex Multi-Point Protocol, Full-Duplex Protocols, Polling, Roll Call And Hub Polling, Traffic management, Congestion control in packet switching networks and Frame relay.

UNIT – VI: DIGITAL MULTIPLEXING:
TDM, T1 carrier system, CCITT-TDM carrier system, CODEC chips, Digital hierarchy, Line Encoding, Frame Synchronization.

UNIT – VII:
Multiplexers, Statistical multiplexer, Concentrator, front-end communication processor, Digital PBX, long haul communication with FDM, Hybrid data.

UNIT – VIII:
OPTICAL COMMUNICATION
Basic Optical Network Topologies and their performances, SONET/SDH – Transmission formats and Speeds, Optical interfaces, SONET/SDH rings and networks.

TEXT BOOKS:

1. W. TOMASI: Advanced Electronic Communications Systems, PHI
2. Data and Computer Communications – William Stallings 7/e, PEI.
3. Optical Communications – B.Gerd Keiser, PHI

REFERENCES:

1. T. HOUSELY: Data Communications and Teleprocessing Systems, PHI.
2. Data and Computer Networking Communications – B.A.Forouzon,3rd TMH.

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DIGITAL SIGNAL PROCESSING

Unit I

The Discrete Fourier Transform

Representation of periodic sequences – the Discrete Fourier series – properties of the Discrete Fourier series – Fourier representation of finite duration sequences – The Discrete Fourier Transform properties of the Discrete Fourier Transform – Linear Convolution using the Discrete Fourier Transform – Two dimensional DFT.

Unit II

Computation of the Discrete Fourier Transform

(i) Efficient computation of the DFT – FFT Algorithms -Direct computation of the DFTc - Radix – 2 FFT algorithm- Radix – 4 FFT algorithm - Implementation of FFT algorithm

(ii) A linear Filtering approach to computation of the DFT - The Geortzel algorithm The chirp – Z – Transformation algorithm Quantization errors in the direct computation of the DFT and FFT algorithms.

Unit III

Digital Fitters Design

FIR – Filters-Magnitude response and Phase response of Digital Filters - Frequency response of linear phase FIR filters - Design techniques for FIR Filters - Design of optimal Linear phase FIR Filters

IIR – Filters - IIR Filter Design by Impulse Invariant method-IIR Filter Design by the Bilinear Transformation-Butterworth Filters – Chebyshev Filters – Inverse Chebyshev filters – Elliptic Filters – Frequency transformation

Unit IV

Discrete Hilbert Transforms

Real and Imaginary part sufficiency for causeral sequences – minimum-phase condition – Hilbert Transform Relations for the DFT – Hilbert Transform Relations for complex sequences.

UnitV

Power Spectrum Estimation

Estimation of spectra from Finite Duration Observations signals – Non-parametric methods for power spectrum Estimation – parametric method for power spectrum Estimation.

Text Books :

1. Digital Signal Processing – Alan V.Oppenheim [for I & IV units], Ronald W.Shafer -PHI
2 Digital Signal Processing principles, algorithms and Applications – John G.Proakis – Maxwell Macmillan – International Editions [for II & V units]
3. Digital Signal Processing – S.Salivahanan & A.Vallavaraj – JMH & C. Gnanapriya [for III unit]

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Subject Code : R 50808

DSP PROCESSORS AND ARCHITECTURES

UNIT I:INTRODUCTION TO DIGITAL SIGNAL PROCESING

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, Analysis and Design tool for DSP Systems MATLAB, DSP using MATLAB.

UNIT II: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 III: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 IV:EXECUTION CONTROL AND PIPELINING

Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models.

UNIT V: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 VI:IMPLEMENTATIONS OF BASIC DSP ALGORITHMS

The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing.

UNIT VII:IMPLEMENTATION OF FFT ALGORITHMS

An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

UNIT VIII: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).

A Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

TEXT BOOKS

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. S. Chand & Co, 2000.

REFERENCES

1. Digital Signal Processors, Architecture, Programming and Applications – B. Venkata Ramani and M. Bhaskar, TMH, 2004.
2. Digital Signal Processing – Jonatham Stein, John Wiley, 2005.

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EMI/EMC

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

II. EMI from apparatus, circuits and open area test sites:
Electromagnetic emissions, noise from relays and switches, non-linearities in circuits, passive intermodulation, cross talk in interference (EMI). Open area test sites and measurements.

III. Radiated and conducted interference measurements and ESD:
Anechoic chamber, TEM cell, GH TEM cell, characterization of conduction currents/voltages, conducted EM noise on power lines, conducted EMI from equipment, Immunity to conducted. EMI detectors and measurements. ESD, Electrical fast transients/bursts, electrical surges.

IV. Grounding, shielding, bonding and EMI filters:
Principles and types of grounding, shielding and bonding, characterization of filters, power lines filter design.

V. Cables, connectors, components and EMC standards:
EMI suppression cables, EMC connectors, EMC gaskets, Isolation transformers, optoisolators, National/International EMC standards.

Text Book:

1. Engineering Electromagnetic Compatibility by Dr. V.P. Kodali, IEEE Publication, Printed in India by S. Chand & Co. Ltd., New Delhi, 2000.

2. Electromagnetic Interference and Compatibility IMPACT series, IIT-Delhi, Modules 1-9.

References:

1. Introduction to Electromagnetic Compatibility, Ny, John Wiley, 1992, by C.R. Pal.

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HIGH SPEED NETWORKS

UNIT – I:
Network Services & Layered Architecture: Traffic characterization and quality of service, Network services, High performance networks, Network elements, Basic network mechanisms, layered architecture.

UNIT – II:
ISDN & B-ISDN: Over view of ISDN, ISDN channels, User access, ISDN protocols, Brief history of B-ISDN and ATM, ATM based services and applications, principles and building block of B-ISDN, general architecture of B-ISDN, frame relay.

UNIT – III:
ATM Networks: Network layering, switching of virtual channels and virtual paths, applications of virtual channels and connections.

UNIT – IV:
QOS parameters, traffic descriptors, ATM service categories, ATM cell header, ATM layer, ATM adaptation layer.

UNIT – V:
Interconnection Networks: Introduction, Banyan Networks, Routing algorithm & blocking phenomenon, Batcher-Banyan networks, crossbar switch, three stage class networks.

UNIT – VI:
Rearrangeable Networks: Rearrangeable class networks, folding algorithm, bens network, looping algorithm.

UNIT – VII:
ATM Signaling, Routing and Traffic Control: ATM addressing**,** UNI signaling, PNNI signaling, PNNI routing, ABR Traffic management.

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

TEXT BOOKS:

1. ISDN & B-ISDN with Frame Relay – William Stallings, PHI.
2. Communication Networks - Leon Garcia widjaja, TMH, 2000.
3. ATM Fundamentals – N. N. Biswas, Adventure books publishers, 1998.

REFERENCE BOOKS:

1. High Performance TCP/IP Networking – Mahbub Hassan , Raj Jain, PHI, 2005.
2. ATM Networks – Rainer Handel, Manfred N. Hubber, Stefan Schroder, Pearson edu., 2002.
3. High Speed Networks and Internets – William Stallings, Pearson edu., 2002.
4. High Performance Communication Networks – T. Walrand & P. Varaiya, 2nd ed., Harcourt Asia Publ.

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NETWORK SECURITY AND CRYPTOGRAPHY

Unit – I: Introduction
Attacks, services and mechanisms, security attacks, security services, a model for internet work security, protection through cryptography, the role of cryptography in network security.

Unit – II: Conventional Encryption
Conventional encryption model, classical encryption techniques, substitution techniques and transposition techniques, block cipher principles, block cipher design principles, block cipher modes of operation.

Unit – III: Conventional Encryption Algorithms:

The data encryption standard, triple DES, International data encryption algorithm, Blowfish, RC5, characteristics of advanced symmetric block ciphers.

Unit – IV: Public-key encryption

Principles of public-key cryptosystems, the RSA algorithm, key management, Authentication requirements, authentication functions, message authentication codes, hash functions, security of hash functions and MAC's.

Unit – V: Digital Signatures and Authentication Protocols:

Digital signatures, Digital signature standard, Authentication Protocols, MD5, message digest algorithm, secure hash algorithm, HMAC.

Unit – VI: Mall security & IP security

Pretty good privacy, S/MIME, IP security overview, IP security architecture, Authentication header, key management.

Unit – VII: System Security

Introducers, viruses and related threats, firewall design principles, trusted systems.

Text Book:

1. Cryptography and Networking Security, Principles and Practice – by William Stallings, PHI/Pearson Education Asia, 2nd Ed. 2000.

Reference Book:

1. Network Security-Private Communication in a Public World, 2nd ed., Kaufman, Perlman & Speciner, PHI, 2003.

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Subject Code : R 50812

NEURAL NETWORKS AND APPLICATIONS

UNIT – I: Fundamental Concepts and Models of Artificial Neural Systems

Biological Neuron, Biological Neuron Models and their artificial models, McCulloch-Pitts Neuron Model, Neuron Modeling for Artificial Neuron Models Neuron Systems. Models of Artificial Neural Networks; Feed forward Network and feed backward Network. Neural Processing, learning and adaptation; Supervised and UnSupervised learning

UNIT-II: **Neural Network Learning rules:** Hebbian Learning Rule, Perceptron Learning Rule, Delta Learning Rule Widrow-Hoff Rule, Correlation Learning Rule, Winner –Take-All Learning rule, Out Star Learning Rule, summary of Learning rules.

UNIT – III: Single Layer Perceptron Classifiers

Classification Model, Features and Decision Regions, Discriminant Functions ,linear Machine and Minimum Distance Classification, Nonparametric training concept Training and classification using the discrete perceptron: algorithm and example. Single Layer Continuous Perceptron Networks for Linearly Separable Classifications. Multicategory Single Layer Perceptron Networks.

UNIT – IV: Multilayer feed forward networks

Linearly nonseparable pattern classification Delta Learning rule for Multiperceptron layer. Generalized Delta Learning rule. Feed forward Recall and Error Back Propagation Training; Examples of Error Back-Propagation. Training errors: Learning Factors; Initial weights, Cumulative Weight Adjustment versus Incremental Updating, steepness of activation function, learning constant, momentum method, Network architecture Versus Data Representation, Necessary number of Hidden Neurons. Application of Back propagation Networks in pattern recognition & Image processing, Madaunes: Architecture & Algorithms.

UNIT - V: Single-Layer Feedback Networks

Basic concepts of Dynamical systems. Mathematical Foundation of Discrete-Time Hop field Networks. Mathematical Foundation of Gradient-Type Hopfield Networks. Transient response of Continuous time Networks. Example Solution of Optimization Problems: Summing networks with digital outputs, Minimization of the Traveling salesman tour length, Solving Simultaneous Linear Equations.

UNIT – VI: Associative Memories-I

Basic concepts, Linear associator Basic concepts of Recurrent Autoassociative memory; Retrieval algorithm. Storage algorithm, Storage Algorithms Performance considerations. Performance concepts of Recurrent Autoassociative memory; Energy Function Reduction capacity of Recurrent Autoassociative memory, Memory convergence versus Corruption, fixed point concept, modified memory Convergence towards fixed points, advantages and limitations.

UNIT-VII: Associative Memories-II Boltzman machines,Bidirectional Associative Memory; Memory architecture, association encoding and decoding, stability considerations, memory examples and performance evaluation, improved coding of memories, multidirectional Associative Memory. Associative Memory of Spatio-temporal Patterns

UNIT – VIII:

Matching And Self-Organizing Networks

Hamming net and MAXNET Unsupervised learning of clusters. Clustering and similarity measures Winnerl take all learning ,recall mode, initialization of weights, separability limitations. Counter propagation networks. feature mapping: Self organizing feature maps, LVPS, Cluster discovery networks(ART1).

TEXT BOOKS:

1. J.M.Zurada: Introduction to Artificial Neural Systems, Jaico Publishers
2. Dr. B. Yagananarayana, Artificial Neural Networks, PHI, New Delhi.

REFERENCE BOOKS:

1. Kishan Mehrotra, Chelkuri K. Mohan, Sanjay Ranka: Elements of Artificial Neural Networks, Penram International
2. Artificial Neural Network – By Simon Haykin, Pearson Education Fundamental of Neural Networks – By Laurene Fausett
3. Introduction Neural Networks Using MATLAB 6.0 - by S.N. Shivanandam, S. Sumati, S. N. Deepa,1/e, TMH, New Delhi.

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REAL TIME OPERATING SYSTEMS

UNIT I:
INTRODUCTION
Definition and Classification of Real time systems: Concept of computer control, sequence, loop and supervisor control, centralized, hierarchical and distributed systems, Human Computer interface, hardware requirement for real time applications, specialized processors, interfaces, communications.

UNIT II:
REAL TIME LANGUAGES:
Special features of languages for real time application, review of data types, concurrency, exception handling, corountines, low level facilities. Overview of Real time languages, modula 2 and Ada as a Real Time Languages. Real Time Operating Systems: (PSOS+V_x WORKS). Scheduling strategies, priority structures, Task management, Real Time Clock Handler, Code sharing, Resource Control, Intertask Communication and Control, Example of Creating and RTOS based on modula 2 kernel; Practical Real Time Operating Systems.

UNIT III:
DESIGN ASPECTS:
Introduction to Design of Real Time Systems, Specification, Preliminary Design, multitasking Approach, monitors, Rendezvous.
Development Methodologies: Yourdon, Methodology, Ward and Mellor Method, HATLEY & Pribhai method, MASXOT, PAISLEY System.

UNIT IV:
DESIGN ANALYSIS:
Introduction:
Petrinets, Analysis of Petri Nets, Scheduling problem Real Time Database, Real Time Vs General Purpose Databases, Transaction priorities and Aborts, Concurrency Control, Disk Scheduling Algorithms, Maintaining Serialization Consistency.

UNIT V:
FAULT TOLERANCE TECHNIQUES: Introduction:
Faults, Errors and Failures, Fault types, Detection and Containment, Redundancy, Integrated Failure Handling.

UNIT VI
RELIABILITY EVALUATION:
Introduction, Parameters, Reliability Models for Hardware, Software Error Models.

TEXT BOOKS:

1. Real Time Computer Control, Stuart Bennett, PHL 1997.
2. Real Time Systems, Krishna C. M. & Kand Shin G.Mc Graw Hill, 1997, L. R. Rabiner & R. W. Schafe.

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Subject Code : R 50814

SPEECH PROCESSING

1. Digital Models for the speech signal. The Process of speech production – Acoustic theory of speech production – Lossless tube digital models for speech signals

2. Time domain models for speech processing : Time dependent processing of seechshort time energy & average magnitude, zero crossing rate, pitch period estimation short time auto correlation function , median smoothing and speech processing.

3. Digital representation of speech waveform quantization – instantaneous and adaptive delta modulation, DPCM, Comparision of systems.

4. Short time Fourier analysis Basic model short time analysis and synthesis of speech , implementation of filter bank summation methods using FFT , pitch detection , analysis –by-synthesis .Analysis-synthesis systems.

5. Homomorphic speech processing complex cepstum approach, pitch detection formant detection, Homomorphic vocoder.

6. Linear predictive coding of speech. Principles of linear predictive analysis, solution of LPC Equation ; prediction error signal, frequency domain representation of LPC analysis ,Relation between the various speech parameter Synthesis of speech from LP parameters and applications.

7. Speech coding: Sub-band coding ,transform coding channel Vocoder , formant Vocoder, ceptral Vocoder, LP Vocoders. Vector quantizer coders.

8. Man-machine communication, speaker recognition system , speech recognition systems.

BOOKS:

1. L.R. Rabiner & R.W Schafer : Digital Processing of Speech Signals, PH.
2. Papamichalis, Practical approach to speech coding, PHI 1987.
3. OWENS, Signal Processing of Speech.
4. DELLAR & PROAKIS, Digital Speech processing.

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Subject Code : R 50815

SYSTEM MODELLING & SIMULATION

UNIT I

Basic Simulation Modeling, Systems, Models and Simulation, Discrete Event Simulation, Simulation of single server queing system, Simulation of Inventory System, Alternative approach to modeling and simulation.

UNIT II

SIMULATION SOFTWARE: Comparison of simulation packages with Programming languages, Classification of Software, Desirable Software features, General purpose simulation packages – Arena, Extend and others, Object Oriented Simulation, Examples of application oriented simulation packages.

UNIT III

BUILDING SIMULATION MODELS: Guidelines for determining levels of model detail, Techniques for increasing model validity and credibility.

UNIT IV

MODELING TIME DRIVEN SYSTEMS: Modeling input signals, delays, System integration, Linear Systems, Motion control models, Numerical Experimentation.

UNIT V

EXOGENOUS SIGNALS AND EVENTS: Disturbance signals, State Machines, Petri Nets & Analysis, System encapsulation.

UNIT VI

MARKOV PROCESS: Probabilistic systems, Discrete Time Markov processes, Random walks, Poisson processes, the exponential distribution, simulating a poison process, Continuous-Time Markov processes.

UNIT VII

EVENT DRIVEN MODELS: Simulation diagrams, Queing theory, simulating queing systems, Types of Queues, Multiple servers.

UNIT VIII

SYSTEM OPTIMIZATION: System Identification, Searches, Alpha/beta trackers, Multidimensional Optimization, Modeling and Simulation methodogy.

TEXT BOOKS:

1. System Modeling & Simulation, An Introduction – Frank L. Severance, John Wiley & Sons, 2001.
2. Simulation Modelling and Analysis – Averill M. Law, W. David Kelton, TMH, 3rd Edition, 2003.

REFRENCE BOOK:

1. Systems Simulation – Geoffery Gordon, PHI, 1978.

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Subject Code : R 50816

TRANSFORM TECHNIQUES

UNIT I

Orthogonal signal spaces, approximations of functions by a set of mutually orthogonal functions, Orthogonality in complex functions, trigonometric & exponential Fourier series, Hilbert Tranforms, Properties and applications

UNIT II

Two Dimentional Fourier Transforms and its applications-I: Concept of Two Dimensional Fourier transforms- properties & their significance, energy & power spectral density functions,

UNIT III

Two Dimentional Transforms and its applications-I: Walsh transforms, Hadamard transform, Discrete Cosine Transforms, Haar Transforms

UNIT IV

Two Dimentional Transforms and its applications-II : Slant, KL transforms, Hough Tranforms, Radon Transforms

UNIT V

Short time Fourier transforms & properties of STFT, continues wavelet transforms, Inverse CWT.

UNIT VI

Introduction to discrete wavelet transforms & orthogonal wavelet decomposition

.

UNIT VII

Multi-resolution Analysis (MRA), Two scale relations, Orthogonal wavelets, their relationship to filter banks, PR QMF filter banks.

UNIT VIII

Alternate wavelet representations.

TEXT BOOKS:

1. Signals & systems, B.P.lathi. BS Publishers 1/e, 2004
2. Wavelet transforms – Introduction to theory & applications, Raghuveer. M.rao, ajit S Bopardikar. Pearson education, Asia
3. Fundamentals of Digital image processing-A.K.Jain, 2/e Pearson

REFERENCE BOOKS:

1. Digital Image Processing- C. Gonzalez & Redwoods 1/e 2001
2. Fundamentals of wavelets – Theory, Algorithms & applications,Jaideva C.Goswami ,Andrew K.Chan ,John Willey & Sons .

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Subject Code : R 50817

VLSI TECHNOLOGY & DESIGN

1. Introduction & review of MOS & BICMOS Technologies, Logic gates, switch logic, basic electrical properties, circuit design processes & scaling.

2. Combinational Logic Networks: Layout design methods, simulation, Network delay, cross talk, power optimization & testing.

3. Sequential Systems &clocking disciplines: Design, Power Optimization, Validation & Testing.

4. Sub-system Design Principles: Combinational shifters, Adders, ALUs, Multiplier, High density memory , FPGA, PLAs.

5. Floor Planning Methods: Placement –Routing, Power & Clock distribution, Packages-I/O Architecture &Pad Design.

6. Architecture Design: Register Transfer Design, High Level Synthesis-Architectures for Low Power –Architecture Testing.

7. Chip Design-Design Methodologies-Examples of chip design from specification to Design Validation, Introduction to CAD tools and Algorithms, Hardware-Software Co-design.

8. Ultra fast VLSI Circuits & systems: Introduction to Ga-As Technology.

BOOKS:

1. Wayne Wolf: Modern VLSI Design,(PHI)2nd Edn.1998.
2. Douglas A. Pucknell, Kamran Eshraghian: Basic VLSI Design,(PHI)3rd Edn.1997.
3. John M.Rabaey: Digital Integrated Circuits(PHI,EEE)1997.
4. Michel John Sabastian: Application Specific Integrated Circuits(Addison Wesley)1997.
5. Geizer R.L., Allen P.E. & Strader NR:VLSI Design Techniques for Analog & Digital Circuits,(McGraw Hill)1990.
6. Carver Mead & Lynn Convay: Introduction to VLSI Systems, Addison Wesley Pub.

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Subject Code : R 50818

TIME-HARMONIC ELECTROMAGNETIC FIELDS

1. **Fundamental concepts:** Introduction, basic equations, constitutive relationships, the generalized current concept, Energy and Power, circuit concepts, complex quantities, complex equations, complex constitutive parameters, complex power, AC characteristics of matter, A discussion of current, AC behavior of circuit elements, singularities of the field.

2. **Introduction to waves:** The wave equation, waves in perfect dielectrics, intrinsic wave constants, waves in lossy matter, reflection of waves, transmission line concepts, wave guide concepts, resonator concepts, radiation, antenna concepts.

3. **Some theorems and concepts:** The source concept, duality, uniqueness, image theory, the equivalence principle, fields in half space, the induction theorem, reciprocity, construction of solutions.

4. **Plane wave functions:** The wave functions, plane waves, The rectangular wave guide, Alternative mode sets, The rectangular cavity, partially filled waveguide, The dielectric slab guide, surface guided waves, modal expansions of fields, currents in waveguides.

5. **Microwave Networks:** Cylindrical Waveguides, Modal Expansions in Waveguides, The network concept, one-port networks, two-port networks.

Suggested Reading:

1. Roger F-Harrington, Time-Harmonic Electromagnetic Fields, Mc.Graw-Hill Book Company, 1961.
2. E.C. Jordan & K.G. Balmain, Electro Magnetic waves and Radiating systems, Second edition, Prentice Hall.

Subject Code : R 50819

MICROWAVE ENGINEERING

1. **S - Matrix theory:** Scattering matrix and its properties, Scattering matrix of transmission lines, Scattering matrix representation of multi port network.

2. **Microwave Components:** Coaxial line components, wave guide components, Directional couplers, Hybrid tee junctions, magic tee, attenuators, ferrite devices, isolators, circulators, cavity resonators, re-entrant cavities, wave meters, detectors, mixers.

3. **Impedance Matching and Network analysis:** Microwave networks and their significance, Some impedance matching techniques, Quarter – wave and tapered-line impedance transforms, Two-port network analysis with transmission matrices, S-parameters and signal flow graphs.

4. **Microwave Resonators and Filters:** A review of resonant components, Field analysis of cavity resonators, Narrowband microwave filters, Wideband microwave filters, Some filter and resonator applications.

5. **Microwave Measurements:** Concepts of microwave measurements, Measurement of low VSWR, Measurement of high VSWR, Measurement of attenuation constant, Measurement of electromagnetic field, Measurement of dielectric constant, Measurement of coupling and directivity, Measurement of Impedance.

Suggested Reading:

1. "Microwave Engineering – Passive Components", Rizzi, PHI, New Delhi, 1999.
2. "Microwave Engineering", R. Chatterjee, East-West Press Pvt. Ltd.
3. "Microwave Engineering", Annapurna Das and Sisir K. Das, TMH publications.

References:

"Microwave Engineering" – D.M. Pozar, 2nd Ed., John Wiley, 1999

Subject Code : R 50820

Microwave Circuits & Microwave Integrated Circuits

Topic of Research: Design & development of SP16T switch

Syllabus:

Unit-I:

Introduction to Microwave circuit concepts: one port junction, terminal voltages & currents in multi port junctions, Poynting's Energy Theorem, Normalized waves and scattering matrix. Properties of [S] matrix.

Unit-II:

Relation between [S], [Z] and [Y] parameters, Wave amplitude transmission matrix [A], relation between [A] and [S], [S] matrix of magic T, E and H plane Tees, directional coupler, Application of Hybrid junction and magic tee.

Unit-III:

MIC technology – Thick film & thin film technology, Hybrid MICs

Unit-IV:

Analysis of strip line & micro-strip line, Method of conformal transformation, Characteristic parameters of strip line and micro-strip lines, Micro-strip circuit design, Impedance transformers, Lumped constant micro-strip circuits.

Unit-V:

Lumped elements for MIC's design & fabrication of lumped elements, circuits using lumped elements.

Unit-VI:

Design of Micro-strip circuits - high power & low power circuits.

References:

1. Altman, JL., Microwave Circuits, D. Van Nostrand Co., Inc., 1964.
2. Microwave Integrated Circuits by D. Van Nostrand Co. Inc.
3. Foundations for Microwave Engineering, McGraw Hill 2nd edn, 1992.
4. Microwave Integrated Circuits by K.G. Gupta & Amarjit Singh.
5. Advances in Microwave by Leo young.

Subject Code : R 50851

ADVANCED COMPUTER ARCHITECTURE & ORGANIZATION

Section – A

Overview: Register and bus organized computers and instruction execution. Output and Input memory and control Organisation. Hard – Wired and Micro programmed control.

Processor Organisation: General Structure of CPU-registers, Stacks, ALU and Control units, Instruction types, Formats Sets and Addressing modes. Basic mathematical operations, Fixed- point addition, subtraction, multiplication and division. Implementation of fixed-point operations and ALU design F.P. operations and their implementation. H.W. fast addition multiplication and division. Principles of array and pipeline processors.

Section – B

Design of Controller: Principles of instruction decoding and implementation, Hard-wired and micro instruction based control units. Horizontal and Vertical classes of micro instructions, Nano-program control. Identifying micro instructions, minimizing micro instruction, encoding control instructions, timing cycles and clock generations. Organisation of micro-program based control unit. Concepts of RISC and comparison with CISC processors.

Memory Organization: Types of memories – serial, random and semi-random access, core semiconductor and bubble memories, memory device characteristic density, speed, access time, costs, destructive, non destructive read out, static memories, dynamic memories and memory refresh. Word length and size of memory hierarchy, memory references, address mapping, relocation mechanism, concepts of memory compaction, principles of virtual memory, segmentation and paging.

Interleaved memories and principles of address interleaving. Associative memories word organized associative memory, masking. Hardware protection features in multi-programmed systems.

Section – C

System Organization :
Communication : Introduction, Bus control, computer Networks.
Input-Output systems : programmed I/O, DMA, Interrupt control, I/O processors. Operating **Systems:** Introduction, concurrency control, system management.
Parallel processing: Introduction – types of parallel processors, performance considerations, pipelined, vector and multiprocessor systems.

References:

1. John.P.Hayes computer architecture & Organisation, McGrawHill, Publisher.
2. M.Morris Mano, Computer System Architecture, Prentice Hall of India.
3. Tanenbaum, Computer Organization & Architecture, Prentic Hall of India.
4. Rafiqquzzman – clandra, Modern Computer Architecture.
5. William Stalings, “Computer Organization & Architecture”, Addison Wesley.
6. Vincent P. Hevling, “Computer Organization & Architecture”, Addison Wesley.
7. Hwang, K & F.A. Briggs, “ Computer Architecture and Parallel Processing”, Mhill.
8. Patterson D.A & J.L. Hennessy, “ Computer Architecture” A Quantative Approach “Morgan Kanfmann Publishers.

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Subject Code : R 50852

ADVANCED DSP

1. Special purpose Hardware for the FFT: Review of FFT fundamentals, FFT indenting Hardware considerations for Radix 2 Algorithms, optimum Radix 2 Hardware structure, FFT computation using fast search memory, Radix 2 and Radix 4 Pipeline FFT, Real time convolution via FFT suing a single RAM and one AE.

2. Effects of finete word length in Digital Tilters numbers representation, coefficient Product quantization, signal scaling, dead band effect effect.

3. Two dimensional signal processing : Two dimensional signals & systems, two dimensional difference equations two dimensional DFT, two dimensional windows two dimensional frequency sampling low pass filters.

4. Multi rate digital signal processing : Decimation by a factor D, Interpolation by a factor I sampling rate conversion by a rational factor I/D sampling rate conversion by a an arbitrary factor.

5. Linear prediction and optimum Linear filters: Forward & Backward linear prediction, properties of the linear prediction error filters, AR lattice & ARMA lattice filters.

6. Power spectrum estimation: Estimation of spectra form finite duration observation of signals, non parametric methods for power spectrum estimation, Barlett methods, welch methods & balackman & tukey methods.

7. Parametric methods: Yule-walker methods, Burg methods

BOOKS :

1. Digital signal Processing (Principles, Algorithms & Applications) - Jhon G.Proalcs & Dimitris G.Manolkis.
2. Theory and Application of Digital Signal Processing - Lawrence R.Rabiner & Bernard Gold.
3. Digital filter analysis and design by A Antoniun (TMH).

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ALGORITHMS FOR VLSI DESIGN AUTOMATION

UNIT I
PRELIMINARIES
Introduction to Design Methodologies, Design Automation tools, Algorithimic Graph Theory, Computational complexity, Tractable and Intractable problems.

UNIT II
GENERAL PURPOSE METHODS FOR COMBINATIONAL OPTIMIZATION
Backtracking, Branch and Bound, Dynamic Programming, Integer Linear Programming, Local Search, Simulated Annealing, Tabu search, Genetic Algorithms.

UNIT III
LAYOUT COMPACTION, PLACEMENT, FLOORPLANNING AND ROUTING
Problems, Concepts and Algorithms.

UNIT IV
MODELLING AND SIMULATION
Gate Level Modelling and Simulation, Switch level Modelling and Simulation.

UNIT V
LOGIC SYNTHESIS AND VERIFICATION
Basic issues and Terminology, Binary-Decision diagrams, Two-Level logic Synthesis

UNIT VI
HIGH-LEVEL SYNTHESIS
Hardware Models, Internal representation of the input Algorithm, Allocation, Assignment and Scheduling, Some Scheduling Algorithms, Some aqspects of Assignment problem, High-level Transformations.

UNIT VII
PHYSICAL DESIGN AUTOMATION OF FPGA'S
FPGA technologies, Physical Design cycle for FPGA's, partitioning and Routing for segmented and staggered Models.

UNIT VIII
PHYSICAL DESIGN AUTOMATION OF MCM'S
MCM technologies, MCM phsical design cycle, Partitioning, Placement - Chip Array based and Full Custom Approaches, Routing – Maze routing, Multiple stage routing, Topologic routing, Integrated Pin – Distribution and routing, Routing and Programmable MCM's.

TEXTBOOKS:

1. Algorithms for VLSI Design Automation, S.H.Gerez, WILEY Student Edition, John wiley & Sons (Asia) Pvt. Ltd., 1999.
2. Algorithms for VLSI Physical Design Automation ,3rd edition, Naveed Sherwani, Springer International Edition, 2005.

REFERENCES

1. Computer Aided Logical Design with Emphasis on VLSI – Hill & Peterson, Wiley, 1993.
2. Modern VLSI Design:Systems on silicon – Wayne Wolf, Pearson Education Asia, 2nd Edition, 1998

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Subject Code : R 50854

BIOMEDICAL SIGNAL PROCESSING

UNIT-I

Discrete and continuous Random variables, Probability distribution and density functions. Gaussian and Rayleigh density functions, Correlation between random variables.

UNIT-II

Stationary random process, Ergodicity, Power spectral density and autocorrelation function of random processes. Noise power spectral density analysis, Noise bandwidth, noise figure of systems

UNIT-III

Data Compression Techniques: Lossy and Lossless data reduction Algorithms. ECG data compression using Turning point, AZTEC, CORTES, Huffman coding, vector quantisation, DCTand the K L transform.

UNIT-IV

Cardiological Signal Processing: Pre-processing. QRS Detection Methods. Rhythm analysis. Arrhythmia Detection Algorithms. Automated ECG Analysis. ECG Pattern Recognition. Heart rate variability analysis.

UNIT-V

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-VI

Signal Averaging, polishing – mean and trend removal, Prony's method. Linear prediction. Yule – walker (Y –W) equations.

UNIT-VII

Neurological Signal Processing: Modeling of EEG Signals. Detection of spikes and spindles Detection of Alpha, Beta and Gamma Waves. Auto Regressive(A.R.) modeling of seizure EEG. Sleep Stage analysis. Inverse Filtering. Least squares and polynomial modeling.

UNIT-VIII

Original Prony's Method. Prony's Method based on the Least Squares Estimate. Analysis of Evoked Potentials.

TEXT BOOKS

1. Rangaraj M. Rangayyan – Biomedical Signal Analysis.
2. D.C.Reddy, Biomedical Signal Processing- principles and techniques, Tata McGraw-Hill, 2005.

REFERENCE BOOKS:

1. Weitkunat R, Digital Bio signal Processing, Elsevier, 1991.
2. Akay M , Biomedical Signal Processing, Academic: Press 1994
3. Cohen.A, Biomedical Signal Processing -Vol. I Time & Frequency Analysis, CRC Press, 1986.
4. Biomedical digital Signal Processing, willis J.Tompkins, PHI,

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Subject Code : R 50855

COMPUTER COMMUNICATIONS

Unit I:
Network Hardware reference model – Transmission media – Narrowband ISDN – Broad band ISDN – ATM.

Unit II:
The data Link layer – Design Issues – Error detection and correction – Elementary Data Link Protocols – Sliding window protocols – Data link layer in HDLC, Internet and ATM.

Unit III:
Channel allocation methods – TDM, FDM, ALOHA, Carrier sense Multiple access protocols, Collision Free protocols – IEEE standard BO2 for LANS – Ethernet, Token Bus, Token ring – Bridges.

Unit IV:
NETWORK LYER Routing Algorithms – Shortest path, Flooding, Flow based Distance vector, Link state, Hierarchical, Broadcast routing, Congestion Control algorithms-General principles of congestion control, Congestion prevention polices, Choke packets and Load shedding.

Unit V:
INTERNET WORKING – Tunneling, internetworking, Fragmentation, network layer in the internet – IP protocols, IP address, Subnets, Internet control protocols, DSPF, BOP, Internet multicasting, Mobile IP. Network layer in the ATM Networks – cell formats, connection setup, routing and switching, service categories, and quality of service, ATM LANs.

Unit VI:
The Transport Layer Elements of transport protocols – addressing, establishing a connection, releasing connection, flow control and buffering and crash recovery, END TO END PROTOCOLS – UDP, reliable Byte Stream (TCP) end to end format, segment format, connection establishment and termination, sliding window revisited, adaptive retransmission, TCP extension, Remote Procedure Call – BLAST, CHAN, SELECT, DCE.

Unit VII:
Application Layer – Network Security – Cryptographic Algorithms – DES, RSA. Security Mechanisms – Authentication Protocols, Firewalls.

Unit VIII:
Application Layer – Name service (DNS) Domains Hierarchy, Name servers. Traditional Applications – SMTP, MIME, World Wide Web – HTTP, Network Management – SNMP.

TEXT BOOKS:

COMPUTER NETWORKSANDREW TANEN BAUM, Prentice Hall of India New Delhi - Third edition.

COMPUTER NETWORKS – A SYSTEM APPROACH –0 Larry L. Peterson & Bruce S. Davie – Second Edition – Harcourt Asia PTE LTD.

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COMPUTER NETWORKS AND NETWORK PROTOCOLS

1. Protocol layering, Data link layer, Design issues, Elementary data link protocols, Sliding window protocol, Example data link protocols.
   The medium access sublayer, Channel allocation problem, Multiple access protocols, Review of IEEE standards for LANs, LAN bridges.

2. The network layer, Design issues, Routing algorithms, Congestion control algorithms, The Transport layer, Transport services, Transport protocols. Internetworking, Internet network layer, Internet transport protocols (TCP and UDP), ATM network layer, ATM transport protocols.

3. The application layer, Security, DNS, SNMP, Electronic Mail, WWW, Multimedia.

4. Network topologies and protocol layering, Architectural model for internetworking, Internet Address classes (chapters 1, 2, 11, 3 & 4 of Text book 2).

5. Internet protocols, Connectionless datagram delivery, routing IP datagrams, UDP, TCP, ARP, RARP, ICMP, CIDR, BOOTP, DHCP (chapters 7, 8, 12, 13, 5, 6, 9,10 & 23 of Text book 2).

6. Routing Protocols, BGP, Autonomous systems, RIP, OSPF, HELLO, Multicasting, Private Network Interconnection – NAT, VPN (chapters 15, 16, 17 & 20 of Text book 2).

7. Application Protocols: DNS, Telnet, RLOGIN, FTP, TFTP, NFS, SMTP, POP, IMAP, MIME (chapters 24, 25, 26 & 27 of Text book 2).

8. Application Protocols: WWW (HTTP), Voice and audio over IP (RTP), SNMP, Protocol dependencies (chapters 28, 29, 30 & 31 of Text book 2).

Text Book:

1. Computer Networks: A. S. Tanenbaum, 4rd Edition, PHI. (For unit I, II and III)
2. Internetworking with TCP/IP, Vol. 1, Douglas E. Comer, 4th Edition, Pearson Education.

Reference Books:

1. An engineering Approach to Computer Networking, S. Keshav, Pearson Education.
2. Computer Networking a Top-Down Approach Featuring the Internet, J. F. Kurose, K. W. Ross, Pearson Education.
3. Data Communications and Networking, A. S. Godbole, TMH.

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Subject Code : R 50857

DESIGN OF FAULT TOLERANT SYSTEMS

1. Basic Concepts : Reliability Concept, Failures and faults, Reliability and failure rate, Relation Between reliability & mean time between failure, maintainability & Availability Reliability of Series and parallel Systems.

2. Test Generation : Fault diagnosis of digital Systems, Test generations for combinational logic circuits – conventional methods, Random testing, transition count testing and signature analysis.

3. Fault Tolerant Design – I : Basic concepts – static, dynamic, hybrid, and self – purging redundancy, Sift – out Modular redundancy (SMR) ,triple modular redundancy, 5MR reconfiguration, use of error correcting codes.

4. Fault Tolerant Design – II : Time redundancy, software redundancy, fail – soft operation , examples of practical fault tolerant systems, introduction to fault tolerant design of VLSI chips.

5. Self Checking Circuits : Design of totally self checking checkers , checkers using m-out of n codes, Berger codes and low cost residue code, self – checking sequential machines, partially self – checking circuits.

6. Fail safe Design : Strongly fault secure circuits, fail – safe design of sequential circuits using partition theory and Berger codes, totally self – checking PLA design.

7. Design for testable combination logic circuits : Basic concepts of testability, controllability and observability. The Read – Muller expansion technique, level OR-AND-OR design, use of control and syndrome – testable design.

8. Testable Design of Sequential Circuits : The scan – path technique, level – sensitive scan design (LSSD) and random Accers scan technique, built – in – test, built – in – test of VLSI chips, design for autonomous self – test, design in testability into logic boards.

BOOKS:

1. Parag K. Lala : Fault Tolerant & Fault Testable Hardware design, (PHI) 1985.
2. Parag K LaLA : Digital Systems design using PLD's (PHI) 1990.
3. N.N. Biswas : Logoc Design Theory (PHI) 1990.

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Subject Code : R 50858

DIGITAL SYSTEM DESIGN

UNIT – I:
DESIGN OF DIGITAL SYSTEMS: ASM charts, Hardware description language and control sequence method, Reduction of state tables, state assignments.

UNIT – II:
SEQUENTIAL CIRCUIT DESIGN: design of Iterative circuits, design of sequential circuits using ROMs and PLAs, sequential circuit design using CPLD, FPGAs.

UNIT – III:
FAULT MODELING: Fault classes and models – Stuck at faults, bridging faults, transition and intermittent faults.
Test generation: Fault diagnosis of Combinational circuits by conventional methods – Path Sensitization technique, Boolean difference method, Kohavi algorithm.

UNIT – IV:
TEST PATTERN GENERATION: D – algorithm, PODEM, Random testing, transition count testing, Signature analysis and testing for bridging faults.

UNIT – V:
FAULT DIAGNOSIS IN SEQUENTIAL CIRCUITS: State identification and fault detection experiment. Machine identification, Design of fault detection experiment.

UNIT – VI:
PROGRAMMING LOGIC ARRAYS: Design using PLA's, PLA minimization and PLA folding.

UNIT – VII:
PLA TESTING: Fault models, Test generation and Testable PLA design.

UNIT – VIII:
ASYNCHRONOUS SEQUENTIAL MACHINE: fundamental mode model, flow table, state reduction, minimal closed covers, races, cycles and hazards.

TEXT BOOKS:

1. Z. Kohavi – "Switching & finite Automata Theory" (TMH)
2. N. N. Biswas – "Logic Design Theory" (PHI)
3. Nolman Balabanian, Bradley Calson – "Digital Logic Design Principles" – Wily Student Edition 2004.

REFRENCE BOOKS:

1. M. Abramovici, M. A. Breues, A. D. Friedman – "Digital System Testing and Testable Design", Jaico Publications
2. Charles H. Roth Jr. – "Fundamentals of Logic Design".
3. Frederick. J. Hill & Peterson – "Computer Aided Logic Design" – Wiley 4th Edition.

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Subject Code : R 50859

IMAGE PROCESSING

UNIT – I:

Image Processing Fundamentals – Image Transforms – Fourier Transform, Walsh, Handamard, DCT, Haar, Slant KL transforms and their properties.

UNIT – II:

Image Enhnacement- Enhancement by point processing, Histogram Processing, Enhancement in Spatial domain and in Frequency domain.

UNIT – III:

Color Image Processing – Fundamentals – Models – Pseudo Color image processing – Basics – Converting to other color spaces – Transformations - Color Smoothing and Sharpening – Color Segmentation – Noise – Color Noise Compression.

UNIT – IV:

Image Filtering and Restoration – Degradation Model – Diagnolisation of Circulant and Block Circulant Matrices – Algebraic approach to restoration- Inverse filtering – LMS Restoration – Constrained least Squares and iterative restoration, Geometric Transformations.

UNIT – V:

Image Compression – Fundamentals – Compression Models – Losleses and Lossy compressions – Compression Standards.

UNIT – VI:

Image Segmentation and Edge Detection – Detection of discontinuities – Edge linking and boundary detection – Region oriented segmentation – use of motion in segmentation – Marr-Hildreth Edge Detection – Canny Detectors.

UNIT – VII:

Representation and Description – Various shemes – Boundary Descriptors – Regional Descriptors

UNIT – VIII:

Morphological Image Processing – Preliminaries – Dilation & Erosion – Opening & Closing – Hit-Miss Transformation – Morphological algorithms – Extension to Grey Scale Images

TEXT BOOKS:

1. Digital Image Processing - Rafael C.Gonzalez, Richard E. Woods, Pearson education, 2nd Edition.
2. Digital Image Processing Using MATLAB - Rafael C.Gonzalez, Richard E.Woods, Steven L.Edding, Pearson Education, 2nd Edition.

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Subject Code : R 50860

LOW POWER VLSI DESIGN

UNIT I: LOW POWER DESIGN, AN OVER VIEW:

Introduction to low- voltage low power design, limitations, Silicon-on-Insulator.

UNIT II: MOS/BiCMOS PROCESSES :

Bi CMOS processes, Integration and Isolation considerations, Integrated Analog/Digital CMOS Process.

UNIT III:LOW-VOLTAGE/LOW POWER CMOS/ BICMOS PROCESSES

Deep submicron processes ,SOI CMOS, lateral BJT on SOI, future trends and directions of CMOS/BiCMOS processes.

UNIT IV:DEVICE BEHAVIOR AND MODELING:

Advanced MOSFET models, limitations of MOSFET models, Bipolar models.

UNIT V:

Analytical and Experimental characterization of sub-half micron MOS devices. MOSFET in a Hybrid- mode environment.

UNIT VI: CMOS AND Bi-CMOS LOGIC GATES:

Conventional CMOS and BiCMOS logic gates. Performance evaluation

UNIT VII: LOW- VOLTAGE LOW POWER LOGIC CIRCUITS:

Comparison of advanced BiCMOS Digital circuits. ESD-free Bi CMOS .Digital circuit operation and comparative Evaluation.

UNIT VIII:LOW POWER LATCHES AND FLIP FLOPS:

Evolution of Latches and Flip flops-quality measures for latches and Flip flops. Design perspective.

TEXT BOOK:

1. CMOS/BiCMOS ULSI low voltage, low power by Yeo Rofail/ Gohl(3 Authors)-Pearson Education Asia 1st Indian reprint,2002

REFERENCES:

1. Digital Integrated circuits , J.Rabaey PH. N.J 1996
2. CMOS Digital ICs sung-moKang and yusuf leblebici 3rd edition TMH 2003 (chapter 11)
3. VLSI DSP systems , Parhi, John Wiley & sons, 2003 (chapter 17)
4. IEEE Trans Electron Devices, IEEE J.Solid State Circuits, and other National and International Conferences and Symposia.

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Subject Code : R 50861

MICRO-CONTROLLERS AND APPLICATIONS

UNIT I: OVERVIEW OF ARCHITECTURE AND MICROCONTROLLER RESOURCES

Architecture of a microcontroller – Microcontroller resources – Resources in advanced and next generation microcontrollers – 8051 microcontroller – Internal and External memories – Counters and Timers – Synchronous serial-cum-asynchronous serial communication - Interrupts.

UNIT II: 8051 FAMILY MICROCONTROLLERS INSTRUCTION SET

Basic assembly language programming – Data transfer instructions – Data and Bit-manipulation instructions – Arithmetic instructions – Instructions for Logical operations on the tes among the Registers, Internal RAM, and SFRs – Program flow control instructions – Interrupt control flow.

UNIT III: REAL TIME CONTROL

Interrupts Interrupt handling structure of an MCU – Interrupt Latency and Interrupt deadline – Multiple sources of the interrupts – Non-maskable interrupt sources – Enabling or disabling of the sources – Polling to determine the interrupt source and assignment of the priorities among them – Interrupt structure in Intel 8051.

UNIT IV: REAL TIME CONTROL TIMERS

Programmable Timers in the MCU's – Free running counter and real time control – Interrupt interval and density constraints.

UNIT V: SYSTEMS DESIGN

Digital and Analog Interfacing Methods, Switch, Keypad and Keyboard interfacings – LED and Array of LEDs – Keyboard-cum-Display controller (8279) – Alphanumeric Devices – Display Systems and its interfaces – Printer interfaces – Programmable instruments interface using IEEE 488 Bus – Interfacing with the Flash Memory – Interfaces – Interfacing to High Power Devices – Analog input interfacing – Analog output interfacing – Optical motor shaft encoders – Industrial control – Industrial process control system – Prototype MCU based Measuring instruments – Robotics and Embedded control – Digital Signal Processing and Digital Filters.

UNIT VI: REAL TIME OPERATING SYSTEM FOR MICRO CONTROLLERS

Real Time operating system – RTOS of Keil (RTX51) – Use of RTOS in Design – Software development tools for Microcontrollers.

UNIT VII: 16-BIT MICROCONTROLLERS

Hardware – Memory map in Intel 80196 family MCU system – IO ports – Progammable Timers and High-speed outputs and input captures – Interrupts – instructions.

UNIT VIII: ARM 32 Bit MCUs

Introduction to 16/32 Bit processors – ARM architecture and organization – ARM / Thumb programming model – ARM / Thumb instruction set – Development tools.

TEXT BOOKS

1. Microcontrollers Architecture, Programming, Interfacing and System Design – Raj Kamal, Pearson Education, 2005.
2. The 8051 Microcontroller and Embedded Systems – Mazidi and Mazidi, PHI, 2000.

REFERENCE BOOKS

1. Microcontrollers (Theory & Applications) – A.V. Deshmuk, WTMH 2005.
2. Design with PIC Microcontrollers – John B. Peatman, Pearson Education, 2005.

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Subject Code : R 50862

MOBILE COMMUNICATIONS

1. Mobile Radio Environment: Representation of a mobile radio signal, caused propagation path loss, causes of fading, reciprocity principle cumulative probability distribution.

2. Calculation of fades and methods of reducing fades: Amplitude fades, Diversity scheme, combining techniques.

3. Frequency plans and the schemes: Frequency reuse, FDM, TDM, Spread spectrum and frequency hopping, cellular concept, spectral efficiency.

4. Multiple access technique : Introduction, FDMA,TDMA, Spread spectrum multiple Access, Space division multiple access, packet Radio.

5. Design parameters at the base station: Antenna locations, Antenna spacing, heights, configuration Noise environment.

6. Design parameters at the mobile: Antenna spacing heights, mobile unit standing still and in motion, sampling rate, directional antennas, frequency dependency, antenna connections and locations on the mobile unit.

7. Cellular CDMA: Narrowband wave propagation wideband signal; propagation, spread techniques in modulation, DS modulation, comparison of different multiple access schemes.

BOOKS:

1. Mobile communications design fundaments by William Y. Lee (John wiley)
2. Wireless Communications by T.S. Rappaprot, PH

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Subject Code : R 50863

OPTICAL COMMUNICATIONS AND NETWORKS

1. Overview of Optical Fiber Communications:
The evolution of fiber optic systems, elements of an optical fiber transmission link.

2. Optical Fibers, Structures, Wave guiding:
Basic optical laws and definitions, optical fiber modes and configurations, Mode theory for circular wave-guides.

3. Optical Sources and Optical Detectors:

Optical Sources	:	
LED	:	LED structures, LED characteristics
LASER Diodes	:	Laser diodes and threshold conditions, Laser diode characteristics.
Optical Detectors	:	Physical Principles of PIN & APD, PIN detector characteristics, Photo detector Noise.

4. Fabrication, cabling and Installation:
Fabrication, fiber optic cables, Installation – Placing the cable.

5. Components of Fiber optic Networks:
Overview of Fiber Optic Networks, Transceivers; Semiconductors optical amplifiers, Erbium doped Fiber Amplifiers, couplers/splitters, wavelength division Multiplexers and de-multiplexers, Filters, Isolators, optical switches.

6. Fiber Optic Networks:
Elements of Architecture of Fiber optic Networks, future trends of fiber optic networks.

Text Books:

1. Optical fiber Communications – Gerd Keiser 2nd ed., MGH.

2. Fiber Optic Communications Technology – Djafar K. Mynbaev and Lowell L. Scheiner (Pearson Education Asia)

Reference:

1. Optical Fiber Communications – A. Selva Rajan, S. Kar, T. Srinivas, TMH.

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Subject Code : R 50864

RADAR SIGNAL PROCESSING

UNIT I

Introduction [1] – Radar Block Diagram, Radar Equation, Information Available from Radar Echo. Review of Radar Range Performance [2] – General Radar Range Equation, Radar Detection with Noise Jamming, Beacon and Repeater Equations, Bistatic Radar.

UNIT II

Detection of Radar Signals in Noise - I [3] : 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 III

Detection of Radar Signals in Noise - II [3] : 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 IV

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, Noiselike Waveforms. Waveform Design Requirements. Optimum Waveforms for Detection in Clutter, Family of Radar Waveforms.

UNIT V

Pulse Compression in Radar Signals : Introduction, Significance, Types. Linear FM Pulse Compression – Block Diagram, Characteristics, Reduction of Time Sidelobes, Stretch Techniques, Generation and Decoding of FM Waveforms – Block Schematic and Characteristics of Passive System, Digital Compression, SAW Pulse Compression.

UNIT VI

Phase Coding Techniques : Principles, Binary Phase Coding, Barker Codes, Maximal Length Sequences (MLS/LRS/PN), Block Diagram of a Phase Coded CW Radar.

UNIT VII

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.

UNIT VIII

Other Types of PC Waveforms – Basics of Nonlinear Binary Phase Coded Sequences, Complementary Codes, Huffman Codes, Concatenated Barker Codes. Limiting in Pulse Compression, Cross-Correlation Properties, Compatibility. Comparison of Different Pulse Compresssion Waveforms.

Text Books :

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

References :

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

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Subject Code : R 50865

RELIABILITY ENGINEERING

Chapter I

Definition of reliability and its management Introduction, History, Selected Definitions, General Relationship between Terms, Reliability Concepts and Patterns of Failure, Variation in Engineering, Control of Variation, Reliability Management, Reliability for System Effectiveness

Chapter II

Failure Statistics, Reliability and Hazard Rates Introduction, Failure Data, Reliability Function, Failure Rate and Hazard Rate, Common Distributions in Failure Mechanisms, Model Selection for Component Failures, Methods of Generic Failure Rate Determination, Failure Analysis

Chapter III

Reliability Prediction and analysis Introduction, Reliability Prediction Based on the Exponential Distribution, Reliability Prediction – Design Based on Weibull Distribution, Reliability Prediction Method, Probability Theory, System Reliability Analysis, Prediction in Perspective

Chapter IV

Reliability testing, Maintainability, Availability and Reliability Computation Introduction, Reliability Tests, Life Testing, Accelerated Testing, Sequential Testing, Automatic Test Equipment, Success-Failure Testing, Failure Reporting and Corrective Action Systems (FRACAS), Demonstration Tests, Maintainability Concepts, Maintainability Programme Elements, Maintainability Modeling and Allocation, Maintainability Prediction, Failure Mode, Effect and Criticality Analysis (FMECA), Design Aids for Maintainability, Maintainability Demonstration, Maintainability Data Systems, Reliability and Maintainability Trade-off, Built-in Test (BIT), Availability Analysis, Planning for Safety, Reliability Data Systems, Computation Approaches for Complex Systems, Conventional Computation Approaches, Expert Systems

Chapter V

Software Reliability, Terotechnology, Maintenance Cost and Budgeting and total Quality management in ISO 9000 Characteristics of Software Reliability Models, Software Reliability Model, Methods of Improving Software Reliability, Hardware Reliability vs. Software reliability, System Trade-offs, History, Definition, The Terotechnology System, The Terotechnology Process, Introducing Terotechnology into Programmes, Strategies for Terotechnology, Training in Terotechnology, Practice of Terotechnology, Maintenance Costs, Cost Codes, Cost Allocations, Overhead Calculations, Budgets, Objectives and Strategies, Cost Reports, Life Cycle Costing, Total Quality Management, ISO 9000, Quality Audit

TEXT BOOKS:

Reliability Engineering & Terotechnology -A.K. Gupta, McMillan Publications

Reference:

Inspection Quality Control and Reliability – S.C. Sarma, Khanna Publications

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Subject Code : R 50866

STOCHASTIC SIGNAL PROCESSING

Introduction to Stochastic Processes:

Definition, properties, stationary and non-stationary processes.

Characteristics of Stochastic Processes & Wiener Filtering:
Partial characterization of a discrete-time stochastic process. Properties of correlation matrix Eigenvalue problem, Properties of eigenvalues & eigenvectors. Power spectral density, Auto regressive models, other stationary stochastic models, Selecting the order of the model, Statement of optimum filtering problem, solution to Wiener half equation, Error performance surface, Normal equation, Principle of orthogonality Minimum mean squared error, Canonical form of error – performance surface.

Linear Prediction:
Linear prediction, forward & backward predictions, prediction-error filter, Levinson-durbin recursion, Relation among the auto correlation function & the reflection coefficients, Transfer function of prediction-error filter, Whitening property, Eigenvector representations of lattice predictors and their correlation properties, prediction errors viewed as a Gram – Schmidt Orthogonalization process, Relation between backward prediction – error vector, positive definiteness of the correlation – matrix of the tap inputs and the minimum – phase property of the prediction error filter, Burg formula.

Method of Estimation by LMS Algorithm:
Structure of adaptive filter, Method of steepest descent, Stability of steepest – descent algorithm, mean squared error, Average tap weight vector and error correlation matrix, Average mean – squared error, Properties of transient behavior of it, Summary of LMS Algorithm, LMS Algorithm in a non-stationary environment, Digital implementation of LMS Algorithm.

Kalman Filter Theory and its Applications:
Recursive minimum mean square estimation for scalar random variables, Statement of Kalman filtering problem, Innovation process, Estimation of state using the innovations process, Filtering methods of LS.

Method of Least Squares:
Statement of linear least – squares estimation problem, Windowing of the data, Principle of orthogonality, Uniqueness theorem, Minimum sum of error squares, Reformulation of deterministic normal equation in terms of correlation functions, Properties of least squares estimates, Linear prediction problem Singular – value decomposition, Estimation of sine waves in the presence of additive noise.

Text Book:

1. Adaptive filter theory - Simon Haykin

Reference Books:

1. Probability, Random Variables and Stochastic processes - by A.Papulis(TMH)
2. Probability, Random Variables and Stochastic processes - by Peebles

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Subject code: R 50867

VHDL PROGRAMMING

1. Hardware Design Environment, H/w Description Language, VHDL background capabilities and H/W abstraction.

2. Basic Concepts of VHDL: Basic Terminology, Entity declaration, Architecture body, Configuration declaration, Digital Hardware modeling in FHDL, Libraries and Packages in VHDL modeling lib & package declaration, package body predefined Data types and operators in standard package.

3. Behavioral Modeling: Entity, architecture models concurrent process statements, variable assignment statements, signal assignment statement, wait, if, case, null, loop, exit, next, assertion, report statements, sequential statements, multi processes, postponed processes.

4. Data flow modeling: Concurrent statements, concurrent versus sequential signal assignment, Delta delay revisited, multiple drivers, conditional signal assignment statement, selected signal assignment statement, block statement, concurrent assertion statement, test bench for an entity testing.

5. Structural Modeling: Component declaration, component instantiation, examples, resolving signal values.

6. Generics and configuration: Generics, configuration specification, declaration, default rules, conversion function, direct instantiation, incremental binding.

7. Subprograms and overloading: Subprograms, H/W modeling using sub programming, sub program overloading (with & without Operators), signatures, default values for parameters. Objects in VHDL, constant class object declaration, Data types classification in VHDL.

8. Packages & Libraries: Package declaration, package body, design features, library, order of analysis, implicit & explicit visibility.

9. Hardware Modeling examples: Modeling Sync, logic, state machine modeling, Modeling a Moore FSM, Mealy FSM.

BOOKS :

1. Jayaram Bhasker : A.VHDL Primer PTR PH 3rd Edn. 2000.
2. Douglas perry : VDHL, 3rd Edn. Mc. Graw Hill, 1999.
3. Navabi : VHDL Analysis & Modeling of Digital Systems McGraw Hill 2nd Edn.1998.

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Subject Code : R 50868

WIRELESS COMMUNICATIONS

1. Introduction to Wireless Comm. Systems – Evolution of Mobile Radio Comm. – Examples of wireless comm. Systems- Paging systems – Cordless Telephone system – Cellular Telephone systems – Comparison & Trends.

2. Modern wireless comm. systems – 2^{nd} and 3^{rd} Generation wireless networks, WLL, WLANS.

3. Cellular Concept – System design fundaments – Frequency re-use – Channel assignment and hand off strategies – Interference and system capacity – trunking and grade of service – Importing coverage and capacity in cellular systems.

4. Radio Propagation and Cellular Engg. Concepts – Fundamental Radio Propagation - Propagation Characteristics - Models of Multi-parts faded radio signals- Industry Standards for Propagation Models. (Refer Text book-2.)

5. Multi Access Techniques for Wireless Comm.: Introduction – FDMA, TDMA – Spread Spectrum multiple access: FHMA, CDMA, SDMA, Packet Radio – Protocols – Capture effect in packet Radio, Capacity of cellular system.

6. Wireless Networks: Introduction – Development of wireless networks, Traffic routing in wireless networks: CKT switching, Packet Switching, X.25 protocols – Wireless data services – Common Channel Signaling (CCS) – ISDN – Signaling system no (S7): Network services part, User Part, Signaling Traffic, Performance.

7. Wireless System and Standards: AMPS, GSM, CDMA digital cellular standards.

Text Book:

1. Wireless Communications Principles and Practice, Second Edition – Theodore S. Rappaport Pearson Education Inc.,
2. Wireless Digital Communication – Modulation, 2 Spread Spectrum Applications – Dr. Kamilo Feher, PHI.

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MICROWAVE ANTENNAS

1. **Antenna Parameters:** Radiation Patterns, Radiation Power Density, Radiation Intensity, Gain, Antenna Efficiency, Bandwidth, Polarization, Input Impedance, Antenna Radiation Efficiency, Antenna as an Aperture, Directivity and maximum Aperture, Friis Transmission Equation, Antenna Temperature.

2. **Reflector Antennas:** Plane Reflector, Corner Reflector, 90^o Corner Reflector, Other Corner Reflectors, Parabolic Reflector, Front-Fed Parabolic Reflector, Cassegrain Reflectors, Lens Antennas, Lenses with $n>1$, Lenses with $n<1$, Lenses with Variable Index of Refraction.

3. **Antenna Arrays:** Introduction, Two Element Array, N-Element Linear Array- Uniform amplitude and Spacing, Broadside Array, Ordinary End-Fire Array, Phased Array, Hansen-Woodyard End-Fire Array, N-Element Linear Array- Directivity, Nonuniform Amplitude, Binomial Array-Design equations.

4. **Microstrip Radiators:** Definition of microstrip antenna, advantages and disadvantages of microstrip antennas, applications, Radiation mechanism and Radiation fields of microstrip antennas, excitation techniques.

5. **Rectangular microstrip patch antennas:** Introduction, Analysis of Rectangular patch radiators, The vector potential approach, Dyadic Green's Function Techniques, the cavity model, Model Expansion Model, the transmission line model, Bandwidth Enhancement Techniques.

Suggested reading:

1. J.D. Kraus, Antennas, MC Graw-Hill, ISE, 1988.
2. Constantine A. Balanis, "Antenna theory analysis and Design", John Wiley.
3. J.J. Bahl and Bhartia, "Microstrip antennas", Artech House, 1982.

References:

1. Samuel Silver, "Microwave Antenna – Theory and Design", IEE Press, London 1984.
2. James J. Hall, P.S. Wood, Microstrip Antenna – Theory and Design, 1981.

Subject Code : R 50870

Electromagnetic Field Theory & Microwave Antennas

Topic of Research: Design & Development of SP16T switch

Syllabus:

Unit-I:

Review of Basic Concepts, Maxwell's equations, Wave equation, Plane waves in lossless and lossy media, Reflection and Refraction.

Unit-II:

Plane wave functions, General Solution of waveguide, Rectangular wave guide, Partially filled wave guide, Dielectric slab guide, Surface wave Transmission lines.

Unit-III:

Antenna Parameters, Theories of radiation, Schelkunoff's equivalence theorem, Image theory, Integral transform method.

Unit-IV:

Aperture antennas, Slots, Horns, Lenses and reflector antennas, Log-periodic and Helical Antennas.

Unit-V:

Linear arrays, Uniform and Nonuniform amplitude distortion, Binominal, Chebyshev and Taylor's distributions.

Unit-VI:

Printed antennas: Rectangular and circular patch antenna design, Feeding techniques for microstrip antennas, Printed antenna arrays, bandwidth enhancement techniques.

References:

1. Harington, RF.. Time Hormonic Electromagnetic Fields, McGraw Hill, 1961.
2. Collin. RE.. Field Theory of guided waves. McGraw Hill, 1960.
3. Samuel Silver, Microwave Antenna Theory and Design, IEE press, 1984.
4. James JR. Hall. PS. Wood, C. Microstrip Antenna – Theory and Design, Peter Peregrinu, 1981.
5. Bahl. I.J. And Bhartia, Microstrip Antennas, Artech House, 1982.