



KALASALINGAM UNIVERSITY
Anand Nagar, Krishnankoil – 626 190.
Department Of Electronics and Communication Engineering

M.Tech
Digital Communication and Network Engineering
Curriculum

Semester I

Subject Code	Subject	L	T	P	C
ECE5001	Data communication Networks	3	0	0	3
ECE5002	Modern Digital Communication Techniques	3	0	0	3
ECE5003	Wireless Communication Networks	3	0	0	3
ECE5004	Advanced Digital Signal Processing	3	0	0	3
ECE5005	Satellite Communications	3	0	0	3
ECE****	Elective I	3	0	0	3
ECE5081	Communication and Networks Lab I	0	0	3	2
	Total	18	0	3	20

Semester II

Subject Code	Subject	L	T	P	C
ECE5006	Speech and Audio Signal Processing	3	0	0	3
ECE5007	Spread Spectrum Techniques	3	0	0	3
ECE5008	Multimedia Compression Techniques	3	0	0	3
ECE5009	Cryptography and Network Security	3	0	0	3
ECE5010	High Speed Switching Architecture	3	0	0	3
ECE****	Elective II	3	0	0	3
ECE5082	Communication and Networks Lab II	0	0	3	2
	Total	18	0	3	20

Semester III

Subject Code	Subject	L	T	P	C
ECE****	Elective-III	3	0	0	3
ECE****	Elective-IV	3	0	0	3
ECE****	Elective-V	3	0	0	3
ECE6098	Project Work Phase –I	-	-	18	6
	Total	9	0	18	15

Semester IV

Subject Code	Subject	L	T	P	C
ECE 6099	Project Work Phase – II	-	-	36	12
	Total	-	-	36	12

ELECTIVES

Subject Code	Subject	L	T	P	C
ECE5011	Local Area Networks	3	0	0	3
ECE5012	Network Management	3	0	0	3
ECE5013	Soft Computing	3	0	0	3
ECE5014	VLSI Design	3	0	0	3
ECE5015	Object Oriented Software Development	3	0	0	3
ECE5016	Genetic Algorithms and Applications	3	0	0	3
ECE5017	Neural Networks and Fuzzy Logic	3	0	0	3
ECE5018	Mobile and Personal Communication	3	0	0	3
ECE6001	Multimedia Databases	3	0	0	3
ECE6002	Advanced Database System	3	0	0	3
ECE6003	Routing in Communication Networks	3	0	0	3
ECE6004	Simulation of Communication Systems and Networks	3	0	0	3
ECE6005	Cellular and Mobile Communication	3	0	0	3
ECE6006	Internet Programming	3	0	0	3
ECE6007	E-Commerce Technology	3	0	0	3
ECE6008	Real Time Embedded Systems	3	0	0	3
ECE6009	Network Architecture and Design	3	0	0	3
ECE6010	Internet Protocols	3	0	0	3
ECE6011	Java 2 Platform, Micro Edition (J2 ME)	3	0	0	3
ECE6012	Embedded Networking	3	0	0	3
ECE6013	Advanced Digital Image Processing	3	0	0	3
ECE6014	Network design using Network Processor	3	0	0	3
ECE6015	Electromagnetic Interference and Compatibility	3	0	0	3
ECE6016	Advanced Radiation Systems	3	0	0	3

OSI Reference Model

Overview of Data Communication and Networking – Analog / Digital transmission, multiplexing and spreading, transmission media, Circuit switching and Telephone network – DSL, ADSL and Cable Modem, Network Configuration, Concepts of layering , ISO's OSI reference model, Physical Layer Standards – RS 232C, RS 449, RS 422A / 423A, X.21 and V.24.

Data Link Layer

Error detection and correction, Data link control – Flow and Error control – Sliding window protocol – ARQ schemes, HDLC protocol – Point to Point Protocol, Multiple Access Techniques – Random Access, Controlled Access, Logical Link Control (LLC) and Medium Access Sub-layer functions – LAN standards – IEEE 802.3 (CSMA/CD) – Fast Ethernet – Giga Bit Ethernet, IEEE 802.4 (Token Bus), IEEE 802.5 (Token Ring), IEEE 802.11 (Wireless LAN).

Network Layer

Inter-networking – Addressing – Routing – Link state and Distance Vector Routing - Congestion control algorithms - Network Layer Protocols – ARP, RARP, IPv4, ICMP, IPv6 and ICMPv6 – Unicast Routing - RIP, OSPF, BGP and Multicast Routing – IGMP, DVMRP, MOSPF, CBT, PIM.

Transport Layer

Processes to Processes Delivery – Transmission Control Protocol (TCP) - User Datagram Protocol, Stream Control Transmission Protocol (SCTP) – Data Traffic – Congestion Control and Quality of Service – Techniques to improve QoS – Integrated Services – Differentiated Services, QoS in switched networks.

Session, Presentation And Application Layers

Services, Network security – security Cryptography, Message confidentiality, message integrity, message authentication, Digital Signature, Entity Authentication, Key Management, Application layer– DNS, E-mail (SMTP), FTP, HTTP, Voice over IP.

References

1. Forouzan, Data Communications and Networking, TMH, 4th Edition, 2006.
2. William Stallings, Data and Computer Communications, PHI, 7th Edition, 2003.
3. Brijendra Singh, Data Communication and Computer Networks, PHI, 2004.
4. Michael A.Gallo, William A. Hancock, Computer Communication and Networking Technologies, Thomson Asia, 2003.
5. S.Tanenbaum, Computer Networks, 4th Edition, Pearson Education Asia Inc., 2004.
6. Leon-Garcia, Widjaja, Communication Networks, Fundamental Concepts and Key Architecture, TMH, 2nd Edition, 2004.

ECE5002 MODERN DIGITAL COMMUNICATION TECHNIQUES 3003

Power Spectrum and Communication

PSD of a synchronous data pulse stream; M-ary Markov source; Convolutionally coded modulation; Continuous phase modulation – Scalar and vector communication over memoryless channel – Detection criteria.

Coherent and Non-Coherent Communication

Coherent receivers – Optimum receivers in WGN – IQ modulation & demodulation – Noncoherent receivers in random phase channels; M-FSK receivers – Rayleigh and Rician channels – Partially coherent receivers – DPSK; M-PSK; M-DPSK, -BER Performance Analysis.

Bandlimited Channels and Digital Modulations

Eye pattern; demodulation in the presence of ISI and AWGN; Equalization techniques – IQ modulations; QPSK; QAM; QBOM; -BER Performance Analysis. – Continuous phase modulation; CPM; CPFSK; MSK, OFDM.

Block Coded Digital Communication

Architecture and performance – Binary block codes; Orthogonal; Biorthogonal; Transorthogonal – Shannon's channel coding theorem; Channel capacity; Matched filter; Concepts of Spread spectrum communication – Coded BPSK and DPSK demodulators – Linear block codes; Hamming; Golay; Cyclic; BCH; Reed – Solomon codes.

Convolutional Coded Digital Communication

Representation of codes using Polynomial, State diagram, Tree diagram, and Trellis diagram – Decoding techniques using Maximum likelihood, Viterbi algorithm, Sequential and Threshold methods – Error probability performance for BPSK and Viterbi algorithm, Turbo Coding.

References

1. M.K.Simon, S.M.Hinedi and W.C.Lindsey, Digital communication techniques; Signalling and detection, Prentice Hall India, New Delhi. 1995.
2. Simon Haykin, Digital communications, John Wiley and sons, 1998.
3. Wayne Tomasi, Advanced electronic communication systems, 4th Edition Pearson Education Asia, 1998.
4. B.P.Lathi, Modern digital and analog communication systems, 3rd Edition, Oxford University press 1998.

Cellular Concept and Wireless Standards

Frequency reuse, Channel Assignment Strategies, Hand off Strategies, Interference and System Capacity, Trunking and Grade of Service, Improving coverage and capacity in cellular systems, interference suppression and power control, multiple access schemes
Standards - GSM, IS-95, UMTS, IMT-2000.

Wireless Networking

1G, 2G, 3G wireless networks, Fixed Network Transmission Hierarchy, Traffic Routing in Wireless Networks, Wireless Data Services, CCS, ISDN, SS7, PCS/PCNs, Protocols for network access, Network Data bases.

Wireless LAN & Blue Tooth

Types of Networks, IEEE 802.11, System and Protocol Architecture, Physical and Medium Access Control Layers, MAC management, 802.11b, 802.11a, HIPERLAN, Blue tooth – Architecture, radio layer, base band layer, link manager protocol, L2CAP, Security, SDP, Profiles, 802.15.

Mobile Network And Transport Layers

Mobile IP, mobile adhoc network – Routing, DSDV, DSR, Traditional TCP, TCP improvements, Indirect TCP, Snooping TCP, mobile TCP, TCP over 2.5 / 3G wireless networks, MAC layer scheduling and connection admission in mobile communication.

Traffic Modeling

Teletraffic modeling and Queuing theoretic analysis of cellular mobile networks, Resource allocation and mobility management.

References

1. Joschen Schiller , Mobile Communication, Pearson Education 2003
2. T.S.Rappaport, Wireless Communications: Principles and Practice, Second Edition, Pearson Education/ Prentice Hall of India, Third Indian Reprint 2003.
3. R. Blake, Wireless Communication Technology, Thomson Delmar, 2003.
4. W.C.Y Lee, Mobile Cellular Telecommunications Systems, McGraw Hill, International Editions 1990.
5. David Tse and Pramod Viswanath, Fundamentals of wireless communication Cambridge University Press, 2005.

Discrete Random Signal Processing

Discrete Random Processes- Ensemble averages, stationary processes, Autocorrelation and Auto covariance matrices. Parseval's Theorem, Sum Decomposition Theorem. Wiener-Khintchine Relation- Power Spectral Density- Periodogram Spectral Factorization, Filtering random processes. Low Pass Filtering of White Noise. Parameter estimation: Bias and consistency.

Spectrum Estimation

Estimation of spectra from finite duration signals, Non-Parametric Methods-Correlation Method , Periodogram Estimator, Performance Analysis of Estimators -Unbiased, Consistent Estimators- Modified periodogram, Bartlett and Welch methods, Blackman & Tukey method. Parametric Methods - AR, MA, and ARMA model based spectral estimation. Parameter Estimation -Yule-Walker equations, solutions using Durbin's algorithm.

Linear Estimation and Prediction

Linear prediction- Forward and backward predictions, Solutions of the Normal equations-Levinson-Durbin algorithms. Least mean squared error criterion -Wiener filter for filtering and prediction, FIR Wiener filter and Wiener IIR filters, Discrete Kalman filter.

Adaptive Filters and Multirate DSP

FIR adaptive filters -adaptive filter based on steepest descent method- Widrow-Hoff LMS adaptive algorithm, Normalized LMS. Adaptive channel equalization-Adaptive echo cancellation-Adaptive noise cancellation- Adaptive recursive filters (IIR). RLS adaptive filters- Exponentially weighted RLS-sliding window RLS. Polyphase filter structures, time-variant structures. Multistage implementation of multirate system. Application to sub band coding - Wavelet transform and filter bank implementation of wavelet expansion of signals.

Digital Signal Processors and its Applications

General purpose Digital Signal Processors: Texas Instruments TMS320 family – Motorola DSP 56333 family – Analog devices ADSP 2100 family – Instruction set of TMS320C50 – simple programs. Detection of foetal heart beats during labour – FFT Spectrum Analyser – Musical Sound Processing.

References

1. Monson H. Hayes, Statistical Digital Signal Processing and Modeling, John Wiley and Sons, Inc., Singapore, 2002.
2. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing, Pearson Education, 2002.
3. John G. Proakis Algorithms for Statistical Signal Processing, Pearson Education, 2002.
4. Emmanuel C. Ifeachor, Barrie W. Jervis, Digital Signal Processing – A Practical Approach, Addison Wesley, 1993.
5. A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall, 1989.
6. Texas Instruments, Users Guide TMS320C50.

1. Implementation of Linear Block Codes.
2. Implementation of DSSS Techniques.
3. Implementation of FHSS Techniques.
4. Simulation of Adhoc Network using GLOMOSIM.
5. Simulation of Modulation and Coding in a AWGN Communication Channel using Simulation Packages.
6. Implementation and study of Stop and Wait, Goback-N and Selective Repeat ARQ protocols.
7. Implementation of Distance Vector routing Algorithms.
8. Implementation of Link State routing Algorithms.
9. Mini Projects.

Orbits and Launching Methods

Origin of Satellite Communication, History of Satellite Communication, Overview Of Satellite System, orbits and launching methods, inclined orbits, sun-synchronous orbit, geostationary orbit, radio wave propagation, polarization.

Earth Segment and Space Segment

Antennas, Altitude and Orbit Control, Station keeping, thermal control, Telemetry Tracking and control subsystem, transponders, antenna subsystem, receive only home TV system, Master antenna TV system, Community antenna TV system, Transmit receive earth stations.

Space Links

The Space Link, Satellite Link Design - Satellite uplink -down link power Budget, Basic Transmission Theory, System Noise Temp, G/T Ratio, Noise Figure, Downlink Design, Design of Satellite Links for Specified C/N - Microwave Propagation on Satellite-Earth Paths. Interference between satellite circuits, Energy Dispersion, propagation characteristics of fixed and mobile satellite links.

Satellite Access Techniques

Single access Vs. multiple access (MA, Classical MA techniques: FDMA, TDMA, Single channel per carrier (SCPC) access - Code division multiple access (CDMA), Demand assignment techniques, Examples of MA techniques for existing and planned systems (e.g. the satellite component of UMTS), Mobile satellite network design, ATM via satellite, TCP/IP via satellite - Call control, handover and call set up procedures, Hybrid satellite-terrestrial networks.

Satellite services

Fixed and mobile services - Multimedia satellite services - Advanced applications based on satellite platforms - INTELSAT series - INSAT, VSAT, Remote Sensing - Mobile satellite service: GSM. GPS, INMARSAT, Navigation System, Direct to Home service (DTH), Special services, E-mail, Video conferencing and Internet connectivity

References

1. Dennis Roddy, Satellite Communications, 3rd Edition, Mc Graw Hill International Editions, 2001.
2. Bruce R.Elbert, The Satellite Communication Applications Hand Book, Artech House Boston, 1997.
3. Wilbur L.Pritchard, Hendri G.Snyderhood, Robert A.Nelson, Satellite Communication Systems Engineering, 2nd Edition, Prentice Hall, New Jersey, 1993.
4. Tri T.Ha, Digital satellite communication, 2nd Edition, McGraw Hill, New york,1990.

Overview

Overview of speech analysis and synthesis, automatic speech recognition, wave basics, acoustic tube modeling of speech production.

Auditory Perception

Ear physiology, Psychoacoustics, models of pitch perception, speech perception, human speech recognition.

Speech Features

The auditory system as a filter bank, the cepstrum as a spectral analyzer, linear prediction.

Synthesis and Coding

Speech synthesis, pitch detection, Vocoders.

Applications

Speech transformations, some aspects of computer music synthesis, speaker verification.

References

1. Ben Gold and Nelson Morgan, Speech and Audio Signal Processing, John Wiley and Sons Inc. , Singapore, 2004
2. L.R.Rabiner and R.W.Schaffer, Digital Processing of Speech signals, Prentice Hall ,1978
3. Quatieri, Discrete-time Speech Signal Processing ,Prentice Hall, 2001.
4. J. R. Deller, Introduction to Discrete Time Signal Processing with Speech Processing Motivations, New York: IEEE Press, Wiley 2006.

Introduction

Origin of Spread Spectrum – Spreading the Spectrum – Progress Gain – Jamming Margin – Direct Sequence System – Direct Sequence Signal Characteristics – Direct Sequence Code – Spectrum relationship – Frequency Hopping Signal Characteristics – Frequency Hopping Rate and No. of frequencies – Time Hopping – Chirp System – Hybrid Forms

Coding

Maximal sequences – Linear Code Generator – Auto Correlation and Cross Correlation of codes – Composite codes – Chip rate and code length – Choosing a linear code – Generating high rate codes – Code selection and Signal spectra – Initial Synchronization – Tracking

Modulation – Correlation And Demodulation

Modulation – Balanced Modulation – Frequency Synthesis – Sending the Information – Remapping the Spread Spectrum – Effect of non synchronous input signal – Base band recovery.

Synchronization

Noise figure and Co-channel users - Dynamic range and AGC - Propagation Medium - Overall Receiver-Transmitter Design – Ranging Techniques – Direction finding – Special Antennas.

Applications Of Spread Spectrum Methods

Space Systems – Avionics Systems – Test Systems and Equipment – Message Protection – Position Location – Test and Evaluation of Spread Spectrum Systems – Sensitivity, Selectivity, Jamming Margin, Synchronous acquisition, loss of Synchronization – Signal to noise ratio Vs Interference level – Process gain – FCC Method – Cross Correlation – Transmitter Measurements.

References

1. R.C.Dixom, Spread Spectrum Systems, John Wiley, 1984.
2. GR Cooper, CD Mc Gillen, Modern Communications and Spread Spectrum, Mc Graw Hill, 1986.
3. M.K.Simon, J.K.Omura, R.A.Scholtz and B.K.Levitt, Spread Spectrum Communication, Vol.1 Vol.II, Vol.III, Computer Science Press, USA, 1984.
4. Roger L.Peterson, Rodger E.Zienia, David E.Borth, Introduction to Spread Spectrum Communications, Prentice Hall Inc., 1995.

Introduction

Overview of information theory - redundancy. Need for Compression – evolution of data compression and its applications -Taxonomy of compression techniques – Overview of source coding, source models, scalar and vector quantization theory, rate distribution theory, vector quantisation, structure quantizers. Evaluation techniques-error analysis and methodologies.

Text Compression

Compaction techniques – Huffman coding – Adaptive Huffman Coding – Arithmetic coding – Shannon-Fano coding – Dictionary techniques – LZW family algorithms.

Audio Compression

Audio signal representation, compression techniques Frequency domain and filtering – Basic sub-band coding – G.722– MPEG audio, progressive encoding for audio – Silence compression, speech compression techniques –Vocoders.

Image Compression

Predictive techniques – DM, PCM, DPCM: Optimal Predictors and Optimal Quantization – Contour based compression, Quad trees – Transform Coding – JPEG Standard – Sub-band coding algorithms: Design of Filter banks – Wavelet based compression: EPIC, SPIHT coders – JPEG 2000 standards - JBIG, JBIG2 standards.

Video Compression

Video compression techniques and standards – MPEG Video Coding– Motion estimation and compensation techniques – H.261 Standard – DVI technology – PLV performance – DVI real time compression.

References

1. Khalid Sayood, Introduction to Data Compression, Morgan Kauffman Harcourt India, 2nd Edition, 2000.
2. David Salomon, Data Compression, The Complete Reference, Springer Verlag New York Inc., 2nd Edition, 2001.
3. Yun Q.Shi, Huifang Sun, Image and Video Compression for Multimedia Engineering, Fundamentals, Algorithms & Standards, CRC press, 2003.
4. Peter Symes, Digital Video Compression, McGraw Hill Pub., 2004.
5. Mark Nelson, Data compression, BPB Publishers, New Delhi, 1998.
6. Mark S.Drew, Ze-Nian Li, Fundamentals of Multimedia, PHI, 1st Edition, 2003.
7. Watkinson.J, Compression in Video and Audio, Focal press, London, 1995.
8. Jan Vozer, Video Compression for Multimedia, AP Profes, New York, 1995

Symmetric Ciphers

Introduction, Classical Encryption Techniques- Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Block Ciphers and Data Encryption Standard - Simplified DES, Block Cipher Principles, Data Encryption Standard, Strength of DES, Differential and Linear Crypt Analysis, Block Cipher Design Principles, Block Cipher Modes of operation.

AES and Confidentiality

Advanced Encryption Standard- Evaluation Criteria for AES, AES Cipher; Contemporary Symmetric Ciphers- Triple DES, Confidentiality using Symmetric Encryption- Placement of Encryption Function, Traffic Confidentiality, Key Distribution, and Random Number Generation.

Public-Key Encryption And Hash Functions

Public Key Cryptography and RSA- Principles of Public Key Cryptosystems, RSA Algorithm; Key Management, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography; Message Authentication and Hash Functions- Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions and MACs; Hash Algorithms- MD5 Message Digest Algorithm; Secure Hash Algorithm, Digital Signatures and Authentication Protocols, Digital Signature Standards.

Network Security Practice

Authentication Applications- Kerberos, X.509 Authentication Service; Electronic Mail Security- Pretty Good Privacy, S/MIME; IP Security- IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations; Web Security- Web Security Considerations, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction.

System Security

Intruders- Intruder Detection, Password Management; Malicious Software- Virus and Related Threats, Virus Counter Measures; Firewalls- Firewall Design Principles, Trusted Systems.

References

1. William Stallings, Cryptography and Network Security, 3rd Edition. Prentice Hall of India, New Delhi, 2004
2. William Stallings, Network Security Essentials, 2nd Edition, Prentice Hall of India, New Delhi, 2004
3. Charlie Kaufman, Network Security: Private Communication in Public World, 2nd Edition, Prentice Hall of India, New Delhi, 2004

High Speed Network

LAN and WAN network evolution through ISDN to BISDN - Transfer mode and control of BISDN - SDH multiplexing structure - ATM standard ; ATM adaptation layers.

LAN Switching Technology

Switching concepts; Switch forwarding techniques; switch path control - LAN switching; cut through forwarding; store and forward - virtual LANs.

ATM Switching Architecture

Switch models - Blocking networks – basic and enhanced banyan networks - sorting networks – merge sorting - rearrangeable networks - full and partial connection networks - nonblocking networks – recursive network – construction and comparison of non-blocking network - switches with deflection routing – shuffle switch - tandem banyan.

Queues in ATM Switches

Internal queuing – Input, output and shared queuing - multiple queuing networks –combined input, output and shared queuing – performance analysis of queued switches.

IP Switching

Addressing mode - IP switching types-flow driven and topology driven solutions - IP Over ATM address and next hop resolution – multicasting - IPv6 over ATM.

References

1. Achille Patavina, Switching Theory: Architectures and performance in Broadband ATM Networks. John Wiley & Sons Ltd., New York, 1998.
2. Christopher Y Metz, Switching protocols & Architectures. McGraw Hill, New York, 1998.
3. Ranier Handel, Manfred N Huber, Stefan Schrodder. ATM Networks-concepts, protocols, applications, 3rd Edition, Adisson Wesley, New York, 1999.
4. John A.Chiong, Internetworking ATM for the internet and enterprise networks. McGraw Hill, New York, 1998.

LAN Fundamentals

Introduction – Elements of LAN – OSI Reference model – Layering concepts – Physical layer – Data Link layer – Network layer – Transport layer – Physical layer standards – Applications of Layered network Architecture.

Data Communication Concepts

Types of signals – signal encoding – Data encoding techniques – signal bandwidth requirements – Multiplexing of signals – methods – error detection – error correction – Retransmission techniques – policies and protocols.

LAN Topologies And Access Techniques

Topologies – star, bus, ring, mesh, hybrid – Random access methods – ALOHA – pure and Slotted – CSMA – CSMA / CD – CSMA/CA – Delay Throughput Characteristics.

Network Interconnections

Issues – Design challenges – Bridges – Quality of Bridges – Services – Router – Traffic control functions – Traffic control modeling – Probability calculations – QoS.

Applications of LAN

Variations on IEEE 802.3 – Optical fibres in CSMA/CD LANS – MAP / TOP, Token ring Networks – Fibre Distributed Data Interface – Voice and Data Integration in LANS.

References

1. Gerd E. Keiser, Local Area Networks, Tata Mc Graw Hill, 1997.
2. Dimitris N. Chorafas, Local Area Network Reference, Tata Mc Graw Hill , Newyork, 1983.
3. Bredan Tangney, Donal O' Mahony, Local Area Networks and their applications, Prentice Hall, 1988.
4. G.Keiser, Optical Fibre Communications, Tata Mc Graw Hill, Newyork, 1983.

Data Communications Overview

Communications protocols and standards, Network Management goals, Organization and functions, Network and System Management, Network Topology, LAN, Network node components-Hubs, Bridges, Routers, Gateways, Switches, WAN, ISDN, Transmission Technology.

Network Standards, Models and language

OSI Network management model-Organizational model-Information model, communication model.Abstract Syntax Notation - Encoding structure, Macros Functional model CMIP/CMIS.

Simple Network Management Protocol (SNMP)

SNMP model -Organizational model-System Overview, The information model, communication model-Functional model, SNMP proxy server, Management information ,protocol remote monitoring.

Broadband Network Management

Broadband networks and services, ATM Technology-VP, VC, ATM Packet, Intergrated service, ATMLAN emulation, Virtual Lan. ATM Network Management-ATM Network reference model, Intergrated local management Interface. ATM Management Information base, Role of SNMD and ILMI in ATM Management, M1, M2, M3, M4 Interface, Management of LAN EmulationATM Digital Exchange Interface Management.

Network Management Applications

Configuration management, Fault management, peformance management, Event Corelation Techniques security Management, Accounting management, Report Management, Policy Based Management Service Level Management.

References

1. Mani Subramanian, Network Management Principles and practice, Addison Wesley New York, 2000.
2. Salah Aiidarous, Thomas Plevayk, Telecommunications Network Management Technologies and Implementations , Eastern Economy Edition IEEE Press, New Delhi, 1998.
3. Lakshmi G. Raman, Fundamentals of Telecommunication Network Management, Eastern Economy Edition IEEE Press, New Delhi, 1999.

Artificial Neural Networks

Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning - Backpropagation networks - Kohnen's self organizing networks - Hopfield network.

Fuzzy Systems

Fuzzy sets and Fuzzy reasoning - Fuzzy matrices - Fuzzy functions - Decomposition - Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.

Neuro - Fuzzy Modeling

Adaptive networks based Fuzzy interface systems - Classification and Regression Trees - Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls.

Genetic Algorithms

Survival of the Fittest - Fitness Computations - Cross over - Mutation -Reproduction - Rank method - Rank space method.

Softcomputing And Conventional AI

AI search algorithm - Predicate calculus - Rules of interference – Semantic networks - Frames - Objects - Hybrid models - Applications.

References

1. Jang J.S.R., Sun C.T. and Mizutani E, Neuro-Fuzzy and Soft computing, Prentice Hall 1998.
2. Timothy J.Ross, Fuzzy Logic with Engineering Applications, McGraw Hill, 1997.
3. Laurene Fausett, Fundamentals of Neural Networks, Prentice Hall, 1994.
4. George J. Klir and Bo Yuan, Fuzzy sets and Fuzzy Logic, Prentice Hall, USA 1995.
5. Nill J.Nelsson, Artificial Intelligence - A New Synthesis, Harcourt Asia Ltd., 1998.
6. D.E . Goldberg, Genetic Algorithms: Search, Optimization and Machine Learning, Addison Wesley,N.Y, 1989.

Overview

VLSI Design Process – Architectural Design – Logical Design – Physical Design – Layout Styles - Full Custom Semi Custom approaches – Overview of wafer fabrication – Wafer processing – Silicon gate NMOS process – CMOS process – N well – P well – Twin Tub – Silicon On Insulator.

Basic Electrical Properties of MOS And CMOS Circuits

NMOS and PMOS enhancement transistors – Threshold voltage – MOS device equations – Basic DC equations – Second order effect – Small signal AC characteristics – NMOS and CMOS inverter – Inverter delay – Pass Transistor – Transmission gate.

Layout Design Rules

Need for design rules – Mead Conway design rules for the Silicon gate NMOS process- CMOS N well / P well design rules – Sheet resistance – Area Capacitance – Wiring Capacitance.

Logic Design

Switch logic- Gate Logic – Inverter – Two input NAND and NOR gate- Other forms of CMOS logic – Dynamic CMOS logic – Clocked CMOS logic – Precharged domino CMOS logic – Structure Design – Simple combinational logic design examples – Parity generator – Multiplexer – Clocked sequential circuits – 2 Phase clocking – Charge storage – Dynamic Register Element – NMOS and CMOS dynamic shift register.

Sub System Design Process

Design of a 4 bit shifter – 4 bit arithmetic processor – ALU Subsystem – Implementing ALU functions with an Adder – Carry look ahead adders – Multipliers – Serial/ Parallel Multipliers – Pipelined multiplier array – Modified booth's algorithm – high density memory – FSM – PLA Control Implementation.

References

1. Douglas A Pucknell and Kamran Eshraghian, Basic VLSI Design, PHI, 3rd Edition, 2004
2. Neil H E West and Kamran Eshraghian, Principles of CMOS VLSI Design : A System Perspective, Addison Wesley, 2nd edition, 2002
3. Wayne Wolf, Modern VLSI Design, Pearson Education Inc., 1997
4. Amar Mukerjee, Introduction to NMOS and CMOS VLSI System Design, PHI, 1986.
5. Caver Mead and Lynn Conway, Introduction to VLSI Systems, Addison Wesley, 1980

Fundamentals

Object-Oriented Programming concepts – Encapsulation – Programming Elements – Program Structure – Enumeration Types — Functions and Pointers – Function Invocation – Overloading Functions – Scope and Storage Class – Pointer Types – Arrays and Pointers – Call-by-Reference – Assertions – Standard template library.

Implementing ADTs And Encapsulation

Aggregate Type struct – Structure Pointer Operators – Unions – Bit Fields – Data Handling and Member Functions – Classes – Constructors and Destructors – Static Member – this Pointer – reference semantics – implementation of simple ADTs.

Polymorphism and Templates

ADT Conversions – Overloading – Overloading Operators – Unary Operator Overloading – Binary Operator Overloading – Function Selection – Pointer Operators – Visitation – Iterators – containers – List – List Iterators. Template Class – Function Templates – Class Templates – Parameterizing – STL – Algorithms – Function Adaptors.

Inheritance

Derived Class – Typing Conversions and Visibility – Code Reuse – Virtual Functions – Templates and Inheritance – Run-Time Type Identifications – Exceptions – Handlers – Standard Exceptions.

Java

Java Basics – Data types , Variables and arrays – Operators – Control Statements – Classes and methods – Inheritance, interfaces – Exception handling –strings – Threads – Stream I/O – packages.

References

1. Ira Pohl, Object-Oriented Programming Using C++, Pearson Education, 2nd Edition, 2003.
2. Stanley B.Lippman, Josee Lajoie, C++ Primer, Pearson Education, 3rd Edition, 2004.
3. Kamthane, Object Oriented Programming with ANSI and Turbo C++, Person Education, 2002.
4. Bhavne , Object Oriented Programming With C++, Pearson Education , 2004.
5. Ken Arnold and James Gosling , The Java Programming Language , Addison Wesley,4th edition, 2005.

Fundamentals of Genetic Algorithm

A brief history of evolutionary computation-biological terminology-search space -encoding, reproduction-elements of genetic algorithm-genetic modeling-Traditional optimization - comparison of GA and traditional search methods.

Genetic Technology

Steady state algorithm - fitness scaling –coding-a multiparameter, mapped, fixedpoint coding-Discretization-constraints- inversion. Genetic programming - Genetic Algorithm in problem solving

Advanced Operators and Techniques in Genetic Research

Dominance, diploidy and abeyance-other micro operators-Genetic Algorithm in engineering and optimization-natural evolution –simulated annealing, Genetic Algorithm in scientific models and theoretical foundations.

Computer Implementation of Genetic Algorithm

Implementing a Genetic Algorithm – computer implementation - low level operator and knowledge based techniques in Genetic Algorithm-Improvement in basic techniques-current applications of genetic algorithms

Current Applications of GA

Applications of Genetic based machine learning-Genetic Algorithm and parallel processors, composite laminates, constraint optimization, multilevel optimization, real life problem.

References

1. Melanie Mitchell, An introduction to Genetic Algorithm, Prentice-Hall of India, New Delhi, 2004.
2. David.E.Golberg, Genetic algorithms in search, optimization and machine learning, Addition,Wesley, 1999
3. S.Rajasekaran and G.A Vijayalakshmi Pai, Neural Networks, Fuzzy logic and Genetic Algorithms, Synthesis and Applications, Prentice Hall of India, New Delhi, 2003.
4. Nils.J.Nilsson, Artificial Intelligence- A new synthesis, Original Edition, 1999.

Artificial Neural Networks

Structure and Composition of Biological Neurons, Artificial neuron, -Typical architectures and Applications - Training, Common activation functions, Single layer and Multi layer network , Back Propagation neural net, Learning Rules.

Perceptron and Neural Nets

Classification – Features – Decision Region – Discriminant function – Linear Classifier – Minimum distance classification – Training and classification using Discrete perceptron – Single Layer , multcategory Perceptron – Multi layer Feedforward Network– feed forward and error back propagation training – Learning factors – Network Architecture – Necessary number of hidden nodes -Hebb Net, Perceptron Adaline, Madaline , Hetroassociative Memory Neural Network, Autoassociative Net, Iterative Autoassociative Net, Bidirectional Associative Memory (BAM)-Architecture, Algorithm and Applications.

Neural Net and its Applications

Dynamical Systems - Kohonen Self organising – Feature mapping, Counter propagation, - Adaptive Resonance Theory-Architecture, algorithm and application - Application to Character recognition.

Fuzzy Logic and its Applications

Fuzzy sets, Fuzzy Relations, Fuzzy Equivalence Relations, Membership representation functions, Defuzzification methods, Extension principle, Approximate Reasoning, Rule based systems, Fuzzy classification and Pattern Recognition, Fuzzy Control systems, Fuzzy decision making - Applications -Fuzzy image processing, Fuzzy optimization.

Neuro-Fuzzy Modeling

Adaptive networks based Fuzzy interfaces-Classification and Representation trees-Data dustemp algorithm –Rule based structure identification-Neuro-Fuzzy controls.

References

1. Laurence Fausett, Fundamentals of Neural Networks, Architecture, Algorithm and Applications, Prentice-Hall, Inc, 1994.
2. Timothy J.Ross, Fuzzy Logic with Engineering Applications, Mc.Graw Hill International Editions, 1995.
3. Phillip D. Wasserman, Neural Computing theory and practice, Van Nostrand Reinhold, New York, 1989.
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Radio Propagation

Radio Propagation Characteristics, Models for Path loss, Shadowing & Multipath fading- delay spread, Coherence bandwidth, Coherence Time, Doppler Spread .

Channel Allocation & Handover

Frequency Reuse, basic theory of hexagonal cell layout, spectrum efficiency, FDM/TDM, Cellular System, channel allocation schemes, Handover analysis, cellular CDMA, Erlang capacity, Antennas for mobile radio and characteristics.

Modulation and Multiple Access Techniques

Digital modulation for Mobile radio, Analysis under fading channel, diversity techniques and RAKE demodulator, Spread Spectrum Communication, Multiple Access Techniques used in Mobile Wireless Communication.

Equalization, Diversity and Coding

Linear and Nonlinear Equalization, Adaptive Equalization, Diversity techniques, RAKE Receiver, Speech codes and channel codes.

PCS & Satellite Systems

PACS – Architecture, PHS, PCS and ISM bands, satellites for Personal Communication Services, WLL, Cordless telephones.

References

1. T. S. Rappaport, Wireless Communications: Principles and Practice, 2nd Edition, Pearson Education, Prentice Hall of India, Third Indian Reprint 2003.
2. W. C. Y. Lee, Mobile Communications Engineering: Theory and applications, 2nd Edition, McGraw-Hill International, 1998.

9. Ethernet LAN protocol - To create scenario and study the performance of CSMA/CD protocol simulation.
10. Implementation of bit stuffing in HDLC.
11. Implementation of Cyclic Codes.
12. Implementation of Adaptive filter in DSP processor.
13. Simulation of QMF using simulator packages.
14. Simulation of wireless LAN 802.11 – MAC protocol.
15. Implementation of adhoc routing algorithm –DSDV, TORA.
16. Implementation of adhoc routing algorithm AODV, DSR.
9. Mini Projects.

Introduction

Overview of Database Management – Threshold Architecture – Informal look at the Relational Model – SQL.

Normal Form

Functional Dependencies – Basic Definition and Some Examples – 1NF, 2NF, 3NF, BCNF – Multivalued Dependencies – Definition and Examples – 4NF – Join Dependencies : Definitions and Examples – 5NF.

OODB And Advanced Data Structures

Introduction to OODBMS – K-D trees – Point Quad Trees – R-trees.

Image And Text Databases

Similarity Based Retrieved – Representing Image DBs with Relation – Representing Image DBs with R-Trees – Stop Lists – Words Term and Frequency Tables – Latent Semantic Indexing – TV Trees.

Video and Audio Databases

Organizing Content of a Single Video – Querying content of Video Libraries – General Model of Audio Data – Indexing Audio Data.

References

1. Elmasri and Navathe, Fundamentals of Database System, 3rd Edition, Pearson Education, 2002.
2. V. S. Subramanian, Principles of Multimedia Database System, Morgan Kaufmann Publishers, Inc, 1998.
3. C. J. Date, An Introduction to Database Systems, 7th Edition, Pearson Education, 2000.

Databases

Conventional Databases, Distributed Databases and Relational Databases – Architecture – Fragmentation – Query Processing – Transaction Processing – Concurrency Control – Recovery.

Object Oriented Databases

Introduction to Object Oriented Data Bases - Approaches - Modeling and Design - Persistence – Query Languages - Transaction - Concurrency – Multi Version Locks - Recovery.

Emerging Systems

Enhanced Data Models - Client/Server Model - Data Warehousing and Data Mining - Web Databases – Mobile Databases.

Database Design Issues

ER Model - Normalization - Security - Integrity - Consistency - Database Tuning - Optimization and Research Issues – Design of Temporal Databases – Spatial Databases.

Current Issues

Rules - Knowledge Bases - Active and Deductive Databases - Parallel databases – Multimedia Databases – Image Databases – Text Database.

References

1. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, R.T.Snodgrass, V.S.Subrahmanian, Advanced Database Systems, Morgan Kaufman, 1997.
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7. Gary W.Hason, James V.Hanson, Database Management and Design, Prentice Hall of India Private Ltd, 1999.

Circuit Switching Networks

Dynamic Alternative Routing- Dynamic Routing in Telephone Network – ATM networks with virtual paths – Statistical multiplexing and homogeneous sources , delay guarantees, No statistical multiplexing , heterogenous sources.

Packet Switching Networks

Distance vector Routing, Link State Routing, Inter domain Routing-Classless Interdomain routing (CIDR), Interior Gateway routing protocols (IGRP) - Routing Information Protocol (RIP), Open Shortest Path First (OSPF), Exterior Gateway Routing Protocol (EGRP) - Border Gateway Protocol (BGP), Apple Talk Routing.

High Speed Networks

Routing in optical networks- Optical link networks- Single hop, multi hop optical networks, hybrid optical networks, photonic networks , Routing in the PLANET network-Packet level Routing – Call level Routing – Network infrastructure -Deflection Routing.- Topologies, Deflection routing Algorithms- Performance of routing algorithms on regular topologies – Deflection routing on time varying topologies, resequencing – unslotted operation.

Mobile Networks

Routing in Cellular Mobile Radio Communication networks- Network Architecture, Air interface functionality, Mobility management, Connectionless Data service for cellular systems, Mobility and Routing in Cellular Digital Packet Data (CDPD) network, Packet Radio Routing-DARPA packet radio network, Routing algorithms for small, medium and large sized packet radio networks.

Mobile Ad-Hoc Networks

Internet based mobile ad-hoc networking, Routing algorithms – Table-driven routing - Destination Sequenced Distance Vector (DSDV), Source initiated on-demand routing- Dynamic Source Routing (DSR), Ad-hoc On- demand Distance Vector (AODV), Hierarchical based routing- Cluster head Gateway Switch Routing (CGSR) and Temporally-Ordered Routing Algorithm (TORA).

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1. M. Steen strub, Routing in Communication networks, Prentice Hall International, NewYork, 1995.
2. Internetworking Technologies Handbook, 4th Edition, Inc. Cisco Systems, ILSG Cisco Systems, 2003.
3. William Stallings, ISDN and Broadband ISDN with Frame Relay and ATM, PHI, New Delhi, 2004.
4. Behrouz A Forouzan, Data Communications and Networking , 3rd Edition, TMH, 2004
5. William Stallings, High Speed Networks TCP/IP and ATM Design Principles, Prentice Hall International, New York, 1998.

Modeling of Communication System

Model of speech and picture signals, Pseudo noise sequences, Non-linear sequences, Analog channel model, Noise and fading, Digital channel model-Gilbert model of busy channels, HF, Troposcatter and satellite channels, Switched telephone channels, Analog and Digital communication system models, Light wave system models.

Simulation of Random Variables and Random Process

Univariate and multivariate models, Transformation of random variables, Bounds and approximation, Random process models-Markov AND a ARMA Sequences, Sampling rate for simulation, Computer generation and testing of random numbers.

Estimation of Performance Measures

Quality of an estimator, estimator for SNR, Probability density functions of analog communication system, BER of digital communication systems, Monte carlo method and Importance sampling method, estimation of power spectral density of a process.

Communication Networks

Queuing models, M/M/I and M/M/I/N queues, Little formula, Burke's theorem ,M/G/I queue, Embedded Markov chain analysis of TDM systems, Polling, Random access systems.

Network of Queues

Queues in tandem, store and forward communication networks, capacity allocation, Congestion and flow chart, Routing model, Network layout and Reliability.

References

1. M.C.Jeruchim, Philip Balaban and K.Sam Shanmugam, Simulation of communication systems, Plenum Press, New York, 1992
2. A.M.Law and W.David Kelton, Simulation Modelling and analysis, Mc Graw Hill Inc., New York ,1991
3. J.F.Hayes, Modelling and Analysis of Computer Communication networks, Plenum Press, New York, 1984
4. Jerry Banks and John S.Carson, Discrete-event system Simulation, Prentice Hall, Inc., New Jersey, 1984

Mobile Radio Propagation

Propagation Models, Propagation Mechanisms, Path Loss models, Small scale Multipath Propagation, Parameters of Mobile Multipath Channels, Rayleigh and Ricean Distributions, level crossing and fading statistics.

Wireless Communication Systems and Standards

Evolution of cellular networks, GSM, CDMA Digital Cellular Standard, Cordless Telephones, WLL, PACS, cellular data services, satellite base wireless systems.

Cellular System Design & Signaling

Channel assignment, cell planning, power control, erlang capacity, database and mobility management, power control, interference and system capacity, signaling standards, antennas for mobile radio.

Modulation Techniques For Mobile Radio

Digital modulation, Linear modulation techniques, GMSK, MFSK, MPSK, QAM, OFDM Transmission Technique, spread spectrum techniques, modulation performance in fading and multipath channels, comparison, equalization and diversity concepts, RAKE receiver.

WAP

Architecture, protocols, security issues, Routing Techniques in Ad Hoc wireless networks.

References

1. T.S.Rappaport, Wireless Communications: Principles and Practice, 2nd Edition, Pearson Education/ Prentice Hall of India, Third Indian Reprint 2003.
2. W.C.Y.Lee, Mobile Communications Engineering: Theory and applications, 2nd Edition, McGraw-Hill International, 1998.
3. Andreas F.Molisch, Wideband Wireless Digital Communications, Pearson Education, 2001.
4. R. Blake, Wireless Communication Technology, Thomson Delmar, 2003.

Basic Network and Web Concepts

Internet standards – TCP and UDP protocols – URLs – MIME – CGI – Introduction to SGML.

JAVA Programming

Java basics – I/O streaming – files – Looking up Internet Address - Socket programming – client/server programs – E-mail client – SMTP - POP3 programs – web page retrieval – protocol handlers – content handlers - applets – image handling - Remote Method Invocation.

Scripting Languages

HTML – forms – frames – tables – web page design - JavaScript introduction – control structures – functions – arrays – objects – simple web applications.

Dynamic HTML

Dynamic HTML – introduction – cascading style sheets – object model and collections – event model – filters and transition – data binding – data control – ActiveX control – handling of multimedia data.

Server Side Programming

Servlets – deployment of simple servlets – web server (Java web server / Tomcat / Web logic) – HTTP GET and POST requests – session tracking – cookies – JDBC – simple web applications – multi-tier applications.

References

1. Deitel and Nieto, Internet and World Wide Web – How to program, Pearson Education Publishers, 2000.
2. Elliotte Rusty Harold, Java Network Programming, O'Reilly Publishers, 2002
3. R. Krishnamoorthy & S. Prabhu, Internet and Java Programming, New Age International Publishers, 2004.
4. Thomno A. Powell, The Complete Reference HTML and XHTML, 2nd edition, Tata McGraw Hill, 2003.
5. Naughton, The Complete Reference – Java2, Tata McGraw-Hill, 3rd edition, 1999.

Introduction

Electronic Commerce – Internet and WWW – Value chains in Electronic Commerce - Infrastructure for Electronic Commerce – Packet Switched Networks – Markup Languages and the Web - Web Clients and Servers – Intranets and Extranets.

Web Based Tools

Web Server Hardware and Performance Evaluation – Software feature sets – Software and Tools – Other Tools - Electronic Commerce Models – Internet Marketing - XML and E-Commerce

Electronic Payment Systems

Basics – Electronic Cash – Electronic Funds Transfer - Electronic Wallets – Smart Cards – Credit card Payments – Digital Payment - Case Studies

Network Security

Threats to Network Security - Cryptography Techniques – Authentication Protocols – Securing The internet connection - Secure Electronic Transaction - Firewall Techniques - Biometrics.

Organizational Concept

EDI - EDI application in business - Legal, Security and Privacy issues - EDI and Electronic commerce – Standardization and EDI – Software Implementation – Message Transport – VANs - Workflow Automation and Coordination - Customization and Internal commerce - Supply chain Management.

References

1. Gary P. Schneider and James T.Perry, Electronic Commerce, Thomson Course Technology, 2004
2. Ravi Kalakota and Andrew B Whinston , Frontiers of Electronic commerce, Addison Wesley, 1996
3. Pete Loshin, Paul A Murphy , Electronic Commerce, 2nd Edition , Jaico Publishers,1996.
4. David Whiteley, e - Commerce : Strategy, Technologies and Applications, McGraw Hill, 2000.

Introduction

Introduction to Embedded systems – Processor and memory organization-Devices and buses for Device Networks – Device drivers and Interrupt servicing mechanism.

RTOS

RTOS – Programming tools – Case studies- Hardware- software Co design in an Embedded system.

Real Time Systems

Basic Real time concepts – Computer hardware – Language issues – Software life Cycle.

Real Time Specifications

Design techniques – Real-time kernels – Intertask communication and synchronization – Real – time memory management.

Multiprocessing Systems

Multiprocessing Systems - Hardware/Software integration- Real time Applications.

References

1. Raj Kamal, Embedded Systems Architecture, Programming and Design, Tata Mc-Graw-Hill, 2003
2. Phillip A.Laplante, Real –Time Systems Design and Analysis, An Engineer’s Handbook, Prentice-Hall of India, 2002
3. R.J.A.Buhr, D.L.Bailey, An Introduction to Real Time Systems: Design to networking with C/C++, Prentice- Hall, International, 1999.
4. Grehan Moore and Cyliax, Real Time Programming: A guide to 32 Bit Embedded Development Reading: Addison- Wisley-Longman, 1998.
5. Haeth, Steve, Embedded systems Design, Newnes, 1997.

Introduction, Requirement Analysis

Overview of Analysis, Architecture and Design Processes-Performance Characteristics, Requirement analysis- User Requirement- Application Requirement- Device Requirement- Network Requirement- Other Requirement, Gathering and Listing Requirements- Developing RMA, Delay and Capacity Requirements- Developing Supplemental Performance Requirements.

Flow Analysis, Network Architecture

Flows-Individual and Composite flow- Critical Flow, Flow models, Flow Specification, Network Architecture- Component Architecture, Reference Architecture, Architectural Models.

Network Management Architecture

Addressing Mechanisms- Classful Addressing - Subnetting-Variable length Subnetting-Supernetting-Private Addressing and NAT, Routing Mechanisms, Addressing Strategies, Routing Strategies, Architectural Consideration, Network management, Network management Mechanisms, Architectural Considerations.

Performance Architecture, Security and Privacy Architecture

Performance Mechanisms- Quality Services- Service level Arrangements, Architectural Consideration- Evaluation of Performance Mechanisms- Internal Relationship- External Relationship, Security and privacy Plan- Administration, Security and privacy Mechanisms, Architectural considerations- Evaluation of Security Mechanisms- Internal Relationship- External Relationship.

Interconnecting Technologies

Developing Criteria for Technology Evaluation, Making Technology Choices for the Network Design, Shared Medium, Switching, hybrid Mechanism-NHRP-MPOA, Applying Interconnection Mechanisms to the Design.

References

1. Network Analysis, Architecture and Design, 2nd Edition (The Morgan Kaufmann Series in Networking) James D. McCabe, Elsevier Science (USA), 2003.
2. Network Architecture & Design, A Field Guide for IT Professionals, Dimarzio, J.F. DiMarzio, SAMS Series
3. Top-Down Network Design Priscilla Oppenheimer from Cisco Press.1999.

Protocol Basics

Introduction – Internet protocol – IP version 4 – IPv4 Addressing – Decimal notation – Internet Control Message Protocol – Design issues – Internet Group Message Protocol – Ipv6 – Addressing – Hexadecimal Notation.

Transport Over IP

Introduction – User Datagram Protocol (UDP) – UDP message format – Protocols using UDP – Transmission Control Protocol – Applications – SCTP – RTP.

Multiprotocol Label Switching

MPLS Fundamentals – Signaling protocols – Label Distribution protocol – Traffic engineering in MPLS – Extensions to RSVP – LSP Tunnels.

Generalized MPLS

Generic signaling extensions – GMPLS – Choosing Reservation protocol- TE – CR-LDP – Generalized RSVP-TE – Generalized CR-LDP.

Applications of IP

IP Encapsulation – VPNs – Mobile IP – Header Compression – Voice over IP – IP Telephony – IP and ATM – IP over Dialup links.

References

1. Adrian Farrel, The Internet and its protocols , Morgan Kaufmann publishers, 2004.
2. Pete Loshin, IPv6 Theory, Protocol and Practice, 2nd Edition, Morgan Kaufmann Publishers, 2004.
3. Uyles Black, TCP / IP and Related Protocols, 2nd Edition, Tata Mc Graw Hill, 1995.

J2ME Overview

J2ME Introduction - J2ME and wireless devices- wireless technology - Radio Data networks – Satellite networks- Cellular Telephone networks - Digital wireless transmission – cell phones and text input - messaging – PDA – Mobile power – Settop box and smart cards.

J2ME Architecture

J2ME Architecture – Small computing devices – Requirements – Runtime environment – MIDlet programming – Java Language for J2ME – J2ME software development kits - Hello world J2ME style – Multiple MIDlets in a MIDlet suite – J2ME Wireless toolkits.

J2ME User Interface

Command items and event processing – High level display user interface – Low level display user interface - simple web applications - Threading – Java Native Interfaces- Swing.

J2ME Networking

Generic connection framework – Hypertext transfer protocol – communication management using HTTP – commands – session management – cookies – Transmit as a background process.

Web Services

Basics – J2EE Multi Tier webservices Architecture – Client Tier – Web Tier implementation – Enterprise Java Beans Tier implementation – SOAP Basics – WSDL and SOAP.

References

1. James Keogh, The Complete reference J2ME, Tata Mc Graw Hill, 2003.
2. Elliotte Rusty Harold, Java Network Programming, O'Reilly publishers, 2000
3. Ed Roman, Mastering Enterprise Java Beans, John Wiley & Sons Inc., 1999.
4. Hortsman & Cornell, CORE JAVA 2 ADVANCED FEATURES, VOL II, Pearson Education, 2002

Embedded Network Requirements

Embedded networking – code requirements – Communication requirements – Introduction to CAN open – CAN open standard – Object directory – Electronic Data Sheets & Device – Configuration files – Service Data Objectives – Network management CAN open messages – Device profile encoder.

CAN OPEN

CAN open configuration – Evaluating system requirements choosing devices and tools – Configuring single devices – Overall network configuration – Network simulation – Network Commissioning – Advanced features and testing.

CAN: Controller Area Network – Underlying Technology CAN Overview – Selecting a CAN Controller – CAN development tools.

Implementation Of CAN OPEN

Implementing CAN open Communication layout and requirements – Comparison of implementation methods – Micro CAN open – CAN open source code – Conformance test – Entire design life cycle.

Issues

Physical layer – Data types – Object dictionary – Communication object identifiers – Emerging objects – Node states.

References

1. Glaf P.Feiffer, Andrew Ayre and Christian Keyold , Embedded Networking with CA and CAN open, Embedded System Academy 2005.

Image Representation and Transforms

Image representation - Gray scale and color Images, image sampling and quantization. Two dimensional orthogonal transforms - DFT, FFT, Haar transform, KLT, DCT.

Image Enhancement and Restoration

Filters in spatial and frequency domains, histogram-based processing, homomorphic filtering. Image Restoration - PSF, circulant and block-circulant matrices, deconvolution, restoration using inverse filtering, Wiener filtering and maximum entropy-based methods.

Morphological Operations and Edge Detection

Edge detection - Non parametric and model based approaches, LOG filters, localization problem. Mathematical morphology - binary morphology, dilation, erosion, opening and closing, duality relations, gray scale morphology, applications such as hit-and-miss transform, thinning and shape decomposition.

Texture Analysis and Computer Tomography

Computer tomography - parallel beam projection, Radon transform, and its inverse, Back-projection operator, Fourier-slice theorem, CBP and FBP methods, ART, Fan beam projection. Image texture analysis - co-occurrence matrix, measures of textures, statistical models for textures - Hough Transform, boundary detection, chain coding and segmentation, thresholding methods.

Image Communication

JPEG, MPEGs and H.26x standards, packet video, error concealment.

References

1. Rafael C. Gonzalez and Richard E. Woods, *Digital Image Processing*, 2nd Edition, Pearson education, 2002.
2. A. K. Jain, *Fundamentals of digital image processing*, Prentice Hall of India, 1989.
3. R.M. Haralick, and L.G. Shapiro, *Computer and Robot Vision*, Vol-1, Addison Wesley, Reading, MA, 1992.
4. R. Jain, R. Kasturi and B.G. Schunck, *Machine Vision*, McGraw-Hill International Edition, 1995.
5. W. K. Pratt, *Digital image processing*, Prentice Hall, 1989.

Introduction and Overview

Introduction – Review of Terminology, Protocols and Packet Formats – Conventional computer hardware and its use in low-end network systems – Algorithms for protocol processing – Packet processing functionality.

Traditional Network Systems

Software architectures for protocol processing on conventional hardware - Advanced hardware architectures - Classification and forwarding – Switching Fabrics - Motivation for network processors.

Network Processor Technology

Complexity of network processor design - Network processor architectures - Scaling a network processor – Language used for Classification – Design Trade off and Consequences.

Processor Technology

Overview of the Intel Network Processors IXP 1200, IXP 425 – Embedded RISC Processor (Strong ARM Core) – Packet Processing Hardware – Reference System and Software Development Kit – Program Model.

Programming Methodology

ACE Run Time Structure and Strong ARM Facilities – Micro Engine Programming I – Micro Engine Programming II – An Example ACE – Intel’s Second Generation Processors.

References

1. Douglas E. Comer, Network Systems Design Using Network Processors, Pearson Education, 2003.
2. Peter Barry, Gerard Hartnett, Designing Embedded Networking Applications, Intel press, 2005.

EMI environment

Sources of EMI, conducted and radiated EMI, Transient EMI, EMI-EMC Definitions and units of parameters.

EMI coupling principles

Conducted, Radiated and Transient Coupling, Common Impedance Ground Coupling, Radiated Common Mode and Ground Loop Coupling, Radiated Differential Mode Coupling, Near Field Cable to Cable Coupling, Power Mains and Power Supply Coupling.

EMI specification / standards / limits

Units of specifications, Civilian standards Military standards.

EMI measurements

EMI Test Instruments /Systems, EMI Test, EMI Shielded Chamber, Open Area Test Site, TEM Cell Antennas, Conductors Sensors/ Injectors/ Couplers, Military Test Method and Procedures, Calibration Procedures.

EMI control techniques

Shielding, Filtering, Grounding, Bonding, Isolation Transformer, Transient Suppressors, Cable Routing, Signal Control, Component Selection and Mounting.

References

1. Bernhard Keiser, Principles of Electromagnetic Compatibility, Artech house, 3rd Edition, 1986.
2. Henry W.Ott, Noise Reduction Techniques in Electronic Systems, John Wiley and Sons, 1988.
3. V.P.Kodali, Engineering EMC Principles, Measurements and Technologies, IEEE Press, 1996.

Basics Concepts of Radiation

Radiation from surface current and current line current distribution, Basic antenna parameters, Radiation mechanism-Current distribution ofn Antennas, Impedance concept-Balance dto Unbalanced transformer.

Radiation From Apertures

Field equivalence principle, Rectangular and circular apertures, Uniform distribution on an infinite ground plane, Aperture fields of Horn antenna- Babinets principle, Geometrical theory of diffraction, Reflector antennas, Design considerations - Slot antennas.

Synthesis of Array Antennas

Types of linear arrays, current distribution in linear arrays, Phased arrays, Optimization of Array patterns, Continuous aperture sources, Antenna synthesis techniques.

Micro Strip Antennas

Radiation mechanisms, Feeding structure, Rectangular patch, Circular patch, Ring antenna. Input impedance of patch antenna, Micro strip Dipole, Microstrip arrays.

EMI S/EMC/Antenna Measurements

Log periodic, I-conical, Log spiral ridge Guide, Multi turn loop, Traveling Wave antenna, Antenna measurement and instrumentation , Amplitude and Phase measurement, Gain, directivity Impedance and polarization measurement, Antenna range, Design and Evaluation.

References

1. Kraus.J.D.,Antennas, 2nd Edition,John wiley and Sons, 2005
2. Balanis.A, Antenna Theory Analysis and Design, John Wiley and Sons, New York, 1982
3. Collin.R.E and Zucker.F, Antenna Theory, Part I, Mc Graw Hill, New York, 1969