ANNA UNIVERSITY COIMBATORE

FACULTY OF

ELECTRONICS & COMMUNICATION

ENGINEERING

BOARD OF STUDIES -ECE

M.E. NETWORK ENGINEERING

CURRICULUM AND SYLLABI

I –IV SEMESTERS

REGULATIONS - 2007

ANNA UNIVERSITY COIMBATORE

M.E. NETWORK ENGINEERING

CURRICULUM 2007 - FULL TIME MODE

SEMESTER – I

Code No.	Course Title	L	T	P	M
Theory					
	Applied Mathematics	3	1	0	100
	Advanced Digital Signal Processing	3	1	0	100
	Modern Digital Communication Techniques	3	0	0	100
	Data communication Networks	3	0	0	100
	Wireless Communication Networks	3	0	0	100
	Mobile and Personal Communications	3	0	0	100
Practical					
	Digital Communication and Networks Lab I	0	0	4	100
	Total	18	2	4	-

SEMESTER – II

Code No.	Course Title	L	T	P	M
Theory					
	High Speed Networks	3	1	0	100
	Speech and Audio Signal Processing	3	0	0	100
	Spread Spectrum Techniques	3	1	0	100
	Elective I	3	1	0	100
	Elective II	3	0	0	100
	Elective III	3	0	0	100
Practical					
	Digital Communication and Networks Lab II	0	0	4	100
	Total	18	2	4	-

SEMESTER – III

Code No.	Course Title	L	T	P	M
Theory					
	Elective IV	3	0	0	100
	Elective V	3	0	0	100
	Elective VI	3	0	0	100
Practical					
	Project Work (Phase I)	0	0	12	200
	Total	9	0	12	-

SEMESTER – IV

Code No.	Course Title	L	T	P	M
	Project Work (Phase II)	0	0	24	400
	Total	0	0	24	-

LIST OF ELECTIVES
M.E. NETWORK ENGINEERING
SEMESTER II

Code No.	Course Title	L	T	P	M
	High Speed, Switching Architecture	3	0	0	100
	Multimedia Databases	3	0	0	100
	Object Oriented Software Development	3	0	0	100
	Advanced Database System	3	0	0	100
	Advance Java Technology	3	0	0	100
	Genetic Algorithms and Applications	3	0	0	100
	Digital Image Processing	3	0	0	100
	Neural Networks and Applications	3	0	0	100
	Network Routing Algorithms	3	0	0	100

LIST OF ELECTIVES
M.E. NETWORK ENGINEERING
SEMESTER III

Code No.	Course Title	L	T	P	M
	Simulation of Communication Systems and Networks	3	0	0	100
	Communication Network Security	3	0	0	100
	Satellite Communication	3	0	0	100
	Network Management	3	0	0	100
	Internet Programming	3	0	0	100
	E-Commerce Technology	3	0	0	100
	Real Time Embedded Systems	3	0	0	100
	Multimedia Compression techniques	3	0	0	100
	Information Theory and Coding	3	0	0	100
	Network System Design Using Network Processor	3	0	0	100
	Wireless Sensor Networks	3	0	0	100
	RF MEMS	3	0	0	100
	Special Electives	3	0	0	100

SEMESTER I

07NE101 APPLIED MATHEMATICS 3 1 0 100

UNIT I
LINEAR ALGEBRAIC EQUATION AND EIGEN VALUE PROBLEMS 9+3

System of equations- Solution by Gauss Elimination, Gauss-Jordan and LU decomposition method- Jacobi, Gauss-Seidal iteration method- Eigen values of a matrix by Jacobi and Power method.

UNIT II
WAVE EQUATION 9+3

Solution of initial and boundary value problems- Characteristics- D'Alembert's Solution - Significance of characteristic curves - Laplace transform solutions for displacement in a long string - a long string under its weight - a bar with prescribed force on one end- free vibrations of a string.

UNIT III
SPECIAL FUNCTIONS 9+3

Bessel's equation - Bessel Functions- Legendre's equation - Legendre polynomials -Rodrigue's formula - Recurrence relations- generating functions and orthogonal property for Bessel functions - Legendre polynomials.

UNIT IV
RANDOM VARIABLES 9+3

One dimensional Random Variable - Moments and MGF – Binomial, Poisson, Geometrical, Normal Distributions- Two dimensional Random Variables – Marginal and Conditional Distributions – Covariance and Correlation Coefficient - Functions of Two dimensional random variable

UNIT V
QUEUEING THEORY 9+3

Single and Multiple server Markovian queueing models - Steady state system size probabilities – Little's formula - Priority queues - M/G/1 queueing system – P.K. formula.

L + T = 45 + 15 = 60

REFERENCES:

1. Sankara Rao.K. "Introduction to Partial Differential Equation ", PHI, 1995.
2. Taha. H.A., "Operations Research- An Introduction " 6th Edition, PHI, 1997.
3. Jain M.K. Iyengar, S.R.K. & Jain R.K., "International Methods for Scientific and Engineering Computation", New Age International (P) Ltd, Publlishers 2003..
4. *Kanpur J.N. & Saxena. H.C. "Mathematical Statistics", S.Chand & Co.,New Delhi, 2003.*
5. Greweal B.S. "Higher Engineering Mathematics", Khanna Publishers, 2005.

07NE102 ADVANCED DIGITAL SIGNAL PROCESSING 3 1 0 100

[Review of discrete-time signals and systems- DFT and FFT, Z-Transform, Digital Filters is recommended]

UNIT I 9
DISCRETE RANDOM SIGNAL PROCESSING

Discrete Random Processes- Ensemble averages, stationary processes, Autocorrelation and Auto covariance matrices. Parseval's Theorem, Wiener-Khintchine Relation- Power Spectral Density-

Periodogram, Spectral Factorization, Filtering random processes. Low Pass Filtering of White Noise. Parameter estimation: Bias and consistency.

UNIT II **9**
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, ARMA model based spectral estimation. Parameter Estimation -Yule-Walker equations, solutions using Durbin's algorithm

UNIT III **9**
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

UNIT IV **9**
ADAPTIVE FILTERS

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.

UNIT V **9**
MULTIRATE DIGITAL SIGNAL PROCESSING

Mathematical description of change of sampling rate - Interpolation and Decimation , Decimation by an integer factor - Interpolation by an integer factor, Sampling rate conversion by a rational factor, Filter implementation for sampling rate conversion- Direct form FIR structures, 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.

L-45 T-15 Total-60

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 et.al.,'Algorithms for Statistical Signal Processing', Pearson Education, 2002.
4. Dimitris G.Manolakis et.al.,'Statistical and adaptive signal Processing', McGraw Hill, Newyork,2000.
5. Rafael C. Gonzalez, Richard E.Woods, 'Digital Image Processing', Pearson Education, Inc., Second Edition, 2004.(For Wavelet Transform Topic)

07NE103 MODERN DIGITAL COMMUNICATION TECHNIQUES 3 0 0 100

UNIT I **9**
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 receives – DPSK; M-PSK; M-DPSK,-BER Performance Analysis.

UNIT II **9**
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; CPFM; CPFSK; MSK,OFDM.

UNIT III **9**

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; Hammning; Golay; Cyclic; BCH ; Reed – Solomon codes..

UNIT IV **9**
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.

UNIT V **9**
SPREAD SPECTRUM SIGNALS FOR DIGITAL COMMUNICATION

Model of spread Spectrum Digital Communication System-Direct Sequence Spread Spectrum Signals, Error rate performance of the coder, Generation of PN Sequences- Frequency-Hopped Spread Spectrum Signals, Performance of FH Spread Spectrum Signals in an AWGN Channel- Synchronization of Spread Spectrum Systems.

Total: 45

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.
5. John G. Proakis, Digital Communications, 4th Edition, McGraw-Hill, New york , 2001

07EN104 DATA COMMUNICATION NETWORKS **3 0 0 100**

UNIT I **9**
DATA COMMUNICATION FUNDAMETNALS AND OSI REFERENCE MODEL

Overview of Data Communication and Networking – Analog / Digital signals and transmission, Simplex / Half and Full duplex and Synchronous / Asynchronous communication – Multiplexing – 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.

UNIT II **9**
DATA LINK LAYER

Error detection and correction – Data link control and protocols – 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).

UNIT III **9**
NETWORK LAYER

Network layer - Services - Virtual circuits and Data-grams – Inter-networking – Addressing – Routing – Link state and Distance Vector Routing - Congestion control algorithms - Network Layer Protocols – ARP, RARP, IPv4, ICMP, IPv6 and ICMPv6 – Uni-cast Routing - RIP, OSPF, BGP and Multicast Routing – IGMP, DVMRP, MOSPF, CBT, PIM.

UNIT IV **9**
TRANSPORT LAYER

Transport layer - Services – Processes to Processes Delivery – Transmission Control Protocol (TCP) - User Datagram Protocol – Data Traffic – Congestion Control and Quality of Service – Techniques to improve QOS – Integrated Services – Differentiated Services.

UNIT V **9**
SESSION, PRESENTATION AND APPLICATION LAYERS

Session layer Design Issues, services - Presentation layer Design Issues – Network security – Cryptography, Message Security, Digital Signature, User Authentication, Key Management, Security Protocols in Internet – Application layer Design Issues – DNS, E-mail (SMTP), FTP, HTTP, WWW, Virtual Terminal Protocol.

Total: 45

REFERENCES :

1. Forouzan : Data Communications and Networking, TMH, 3rd Edition, 2004.
2. William Stallings,Data and Computer Communications,Eighth Edition,Printice Hall of India Private Limited,2007
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.
7. Gerd E.Keiser : Local Area Networks, TMH, 2nd Edition, 2002

07NE105 WIRELESS COMMUNICATION NETWORKS 3 0 0 100

UNIT I **9**
WIRELESS MEDIUM:

Air Interface Design – Radio propagation mechanism – Pathloss modeling and Signal Coverage – Effect of Multipath and Doppler – Channel Measurement and Modelling – Simulation of Radio Channel.

UNIT II **9**
WIRELESS MEDIUM ACCESS:

Fixed Assignment Access for Voice Networks – Random Access for Data Networks – Integration of Voice and Data Traffic.

UNIT III **9**
WIRELESS NETWORK OPERATION:

Wireless Network Topologies – Cellular Topology – Cell fundamentals – Signal to Interference Ratio – Capacity Expansion – Mobility Management – Resources and Power Management – Security in Wireless Networks.

UNIT IV **9**
WIRELESS WAN:

GSM and TDMA Technology – Mobile Environment – Communication in the Infrastructure – CDMA Technology – IS95 – IMT2000 – Mobile Data Networks – CDPD Networks – GPRS – Mobile Application Protocol.

UNIT V **9**
WIRELESS LANS AND HIPERLANS:

Introduction to wireless LANs – IEEE 802.11 – WPAN IEEE 802.15 –Mobile AdHoc Networks(MANET)-Principle and operation - Wireless Home Networking – Concepts of Bluetooth Technology – Wireless Geolocation.

Total: 45

REFERENCES:

1. Kaveth Pahlavan, K.Prasanth Krishnamurthy, "Principles of Wireless Networks", Pearson Education Asia, 2002
2. Leon Garcia, Widjaja, "Communication Networks", Tata McGraw Hill, New Delhi, 2000.
3. William Stallings, "Wireless Communications and Networks",Second Edition Prentice Hall,India 2007
4. Jon W Mark , Weihua Zhuang,"Wireless communication and Networking",Prentice Hall India 2003

07NE106 MOBILE AND PERSONAL COMMUNICATIONS 3 0 0 100

UNIT I **9**
INTRODUCTION TO MOBILE AND PERSONAL COMMUNICATION

History of wireless communications, Mobile and Personal communications: Cell phone generations, cellular networks, The mobile radio environment, Cellular concept and frequency reuse, Multiple access technologies for cellular systems, Channel assignment and hand off, Mobile radio interference.

UNIT II **9**
PROPAGATION ISSUES

Prediction of propagation loss-Prediction over flat terrain, Point-point prediction, Calculation of fading and methods of reducing fading- Amplitude fading, Selective fading, Diversity schemes, combining techniques.

UNIT III **9**
ANTENNA SYSTEMS

Design parameters at the Base station- Antenna locations, spacing, heights, configurations, Design parameters at the Mobile unit- Directional antennas and diversity schemes, Antenna connections and locations.

UNIT IV **9**
PERSONAL COMMUNICATION SYSTEMS (PCS)

The concept of PCS/PCN, Function , Evolution of personal Communications, Requirements of PCS,PCS environment, Differences between PCS and Cellular systems, IS-136(TDMA)PCS, IS-95 CDMA PCS, Data Communication with PCS, PCS standards, PCS economics

UNIT V **9**
UNIVERSAL PERSONAL TELECOMMUNICATION (UPT)

UPT: Concept and service aspects, Functional Architecture, Numbering, Routing and Billing aspects, Access security requirements for UPT Digital Cellular Mobile Systems- GSM, IS-136, PDC, IS-95, IMT-2000: Third generation Mobile Communication Systems, W-CDMA, CDMA-2000, EDGE

REFERENCES

1. William C.Y.Lee, "Mobile Communications Design Fundamentals", second edition, John Wiley & sons, 1993.
2. RajPandya, "Mobile and Personal Communication systems and services", PHI, New Delhi, 2003.
3. Blake, "Wireless Communication Technology", Thomson Asia Pte, Ltd, Singapore, 2001.
4. Bud Bates, "Wireless networked telecommunications- Concepts, Technology and Implementation" , McGraw-Hill International Editions, 1995.
5. Jack.M.Holtzman, David J. Goodman (Er.s), " Wireless and Mobile Communications", Allied Publishers Limited, 1996.
6. Andy Dorman, "The Essential Guide to Wireless Communications applications", Pearson Education Asia, 2001.
7. Jon W Mark , Weihua Zhuang,"Wireless communication and Networking",Prentice Hall India 2003

07NE107 DIGITAL COMMUNICATION AND NETWORKS LABORATORY I 0 0 4 100

1. Simulation of Modulation and Coding in a AWGN Communication Channel using Simulation Packages.
2. Implementation of Adaptive Filters, periodogram and multistage multirate system in DSP Processor
3. Simulation of QMF using Simulation Packages.
4. Implementation of Linear and Cyclic Codes.
5. Implementation and study of Stop and Wait, Goback-N and Selective Repeat ARQ protocols
6. Implementation of Distance Vector and Link State routing Algorithms.
7. Ethernet LAN protocol - To create scenario and study the performance of CSMA/CD protocol ethrol simulation
8. Simulatiobn of AdHoc Network using GLOMOSIM

SEMESTER II

07NE201 HIGH SPEED NETWORKS 3 1 0 100

UNIT I 9

HIGH SPEED NETWORKS

Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logical Connection, ATM Cell – ATM Service Categories – AAL. High Speed LAN's: Fast Ethernet, Gigabit Ethernet, Fibre Channel – Wireless LAN's.

UNIT II 9

CONGESTION AND TRAFFIC MANAGEMENT

Queuing Analysis- Queuing Models – Single Server Queues – Effects of Congestion – Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.

UNIT III 9

TCP AND ATM CONGESTION CONTROL

TCP Flow control – TCP Congestion Control – Retransmission – Timer Management – Exponential RTO backoff – KARN's Algorithm – Window management – Performance of TCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes – Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats, ABR Capacity allocations – GFR traffic management.

UNIT IV **9**
INTEGRATED AND DIFFERENTIATED SERVICES

Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ – Random Early Detection, Differentiated Services.

UNIT V **9**
PROTOCOLS FOR QOS SUPPORT

RSVP – Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms – Multiprotocol Label Switching – Operations, Label Stacking, Protocol details – RTP – Protocol Architecture, Data Transfer Protocol, RTCP.

L-45 T-15 Total-60

REFERENCES

1. William Stallings, "High Speed Networks and Internet", Second Edition, Pearson Education, 2002.
2. Warland, Pravin Varaiya, "High Performance Communication Networks", Second Edition, Jean Harcourt Asia Pvt. Ltd., 2001.
3. Irvan Pepelnjk, Jim Guichard, Jeff Apcar, "MPLS and VPN Architecture", Cisco Press, Volume 1 and 2, 2003.

07NE202 SPEECH AND AUDIO SIGNAL PROCESSING **3 0 0 100**

UNIT I **8**

Speech production mechanism – Nature of Speech signal – Discrete time modelling of Speech production – Representation of Speech signals – Classification of Speech sounds – Phones – Phonemes – Phonetic and Phonemic alphabets – Articulatory features.
Music production – Auditory perception – Anatomical pathways from the ear to the perception of sound – Peripheral auditory system – Psycho acoustics

UNIT II
TIME DOMAIN METHODS FOR SPEECH PROCESSING **8**

Time domain parameters of Speech signal – Methods for extracting the parameters Energy, Average Magnitude – Zero crossing Rate – Silence Discrimination using ZCR and energy – Short Time Auto Correlation Function – Pitch period estimation using Auto Correlation Function

UNIT III
FREQUENCY DOMAIN METHOD FOR SPEECH PROCESSING **9**

Short Time Fourier analysis – Filter bank analysis – Formant extraction – Pitch Extraction – Analysis by Synthesis- Analysis synthesis systems- Phase vocoder—Channel Vocoder.

HOMOMORPHIC SPEECH ANALYSIS:
Cepstral analysis of Speech – Formant and Pitch Estimation – Homomorphic Vocoders.

UNIT IV **10**
LINEAR PREDICTIVE ANALYSIS OF SPEECH

Formulation of Linear Prediction problem in Time Domain – Basic Principle – Auto correlation method – Covariance method – Solution of LPC equations – Cholesky method – Durbin's Recursive algorithm – lattice formation and solutions – Comparison of different methods – Application of LPC parameters – Pitch detection using LPC parameters – Formant analysis – VELP – CELP.

UNIT V
APPLICATION OF SPEECH & AUDIO SIGNAL PROCESSING 10

Algorithms: Spectral Estimation, dynamic time warping, hidden Markov model – Music analysis – Pitch Detection – Feature analysis for recognition – Music synthesis – Automatic Speech Recognition – Feature Extraction for ASR – Deterministic sequence recognition – Statistical Sequence recognition – ASR systems – Speaker identification and verification – Voice response system – Speech Synthesis: Text to speech, voice over IP.

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.L.Flanagan – Speech analysis: Synthesis and Perception – 2nd edition – Berlin – 1972
5. I.H.Witten – – Principles of Computer Speech – Academic Press – 1982

07NE203 SPREAD SPECTRUM TECHNIQUES 3 1 0 100

UNIT I 9
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

UNIT II 9
CODE GENERATION
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

UNIT III 9
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.

UNIT IV 9
SYNCHRONISATION:
Noise figure and Cochannel users - Dynamic range and AGC - Propagation Medium - Overall Receiver-Transmitter Design – Ranging Techniques – Direction finding – Special Antennas.

UNIT V 9
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.

L-45 T-15 Total-60

REFERENCES

1. R.C.Dixon, “Spread Spectrum Systems with commercial appications”, Wiley Interscience, 3rd Edition, 1994.
2. George Cooper & Clare. D. Mc Gillen, “Modern Communications and Spread Spectrum”, Mc Graw Hill, 1985.

3. M.K.Simon, J.K.Omura, R.A.Scholtz , "Spread Spectrum Communications Handbook, Elctronic Edition", McGraw Hill, 1st Edition, 2001.
4. Rodger E. Ziemer, Roger L. Peterson, David E. Borth, "Introduction to Spread Spectrum Communications", Prentice Hall Inc., 1995.

07NE204 DIGITAL COMMUNICATION AND NETWORK LAB II 0 0 4 100

1. Simulation and implementation of congestion control algorithm in ATM Network. (using free ATM network simulator software)
2. Simulation of ATM Switches.
3. Implementation of DS-SS technique using Spread Spectrum trainer kits.
4. Implementation of FH-SS technique using Spread Spectrum trainer kits.
5. Simulation of audio compression algorithm
6. Implementation of Analog Interface System for speech signal (active LPF + ADC + Loop back DAC + Reconstruction)
7. Performance evaluation of CDMA Systems
8. Simulation of IEEE 802.11 MAC protocol

LIST OF ELECTIVES
SEMESTER II

07NE11 HIGH SPEED SWITCHING ARCHITECTURE 3 0 0 100

UNIT I **9**
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.

UNIT II **9**

LAN SWITCHING TECHNOLOGY

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

UNIT III **9**
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.

UNIT IV **9**

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.

UNIT V **9**
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.

Total: 45

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.

07NE12 MULTIMEDIA DATABASES

3 0 0 100

UNIT I **9**
INTRODUCTION

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

UNIT II **9**
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.

UNIT III **9**
OODB AND ADVANCED DATA STRUCTURES

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

UNIT IV **9**
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.

UNIT V **9**
VIDEO AND AUDIO DATABASES

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

TOTAL : 45

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”, Seventh Edition, Pearson Education, 2000.
4. S. Khoshafian and A. B. Bakor, “Multimedia and Imaging Databases”, Morgan Kaufmann, 1996.

07NE13 OBJECT ORIENTED SOFTWARE DEVELOPMENT **3 0 0 100**

UNIT I **9**
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.

UNIT II **9**
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.

UNIT III **9**
POLYMORPHISM

ADT Conversions – Overloading – Overloading Operators – Unary Operator Overloading – Binary Operator Overloading – Function Selection – Pointer Operators – Visitation – Iterators – containers – List – List Iterators.

UNIT IV **9**
TEMPLATES

Template Class – Function Templates – Class Templates – Parameterizing – STL – Algorithms – Function Adaptors.

UNIT V **9**
INHERITANCE

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

TOTAL : 45

REFERENCES

1. Ira Pohl, "Object–Oriented Programming Using C++", Pearson Education, Second Edition, 2003.
2. Stanley B.Lippman, Josee Lajoie, "C++ Primer", Pearson Education, Third Edition, 2004.
3. Kamthane," Object Oriented Programming with ANSI and Turbo C++", Person Education, 2002.
4. Bhave , " Object Oriented Programming With C++", Pearson Education , 2004.

07NE14 ADVANCED DATABASE SYSTEM **3 0 0 100**

UNIT I **9**
DATABASES

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

UNIT II **9**
OBJECT ORIENTED DATABASES

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

UNIT III **9**
EMERGING SYSTEMS

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

UNIT IV **9**
DATABASE DESIGN ISSUES

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

UNIT V **9**
CURRENT ISSUES

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

TOTAL : 45

REFERENCES

1. Elisa Bertino, Barbara Catania, Gian Piero Zarri, “Intelligent Database Systems”, Addison-Wesley, 2001.
2. Carlo Zaniolo, Stefano Ceri, Christos Faloustsos, R.T.Snodgrass, V.S.Subrahmanian, “Advanced Database Systems”, Morgan Kaufman, 1997.
3. Gary W.Hason, James V.Hanson, "Database Management and Design", Prentice Hall of India Private Ltd, 1999.
4. N.Tamer Ozsu, Patrick Valduriez, “Principles of Distributed Database Systems”, Prentice Hal International Inc., 1999.
5. C.S.R Prabhu, “Object-Oriented Database Systems”, Prentice Hall of India, 1998.
6. Abdullah Uz Tansel et al, “Temporal Databases: Theory, Design and principles”, Benjamin Cummings Publishers, 1993.
7. Raghu Ramakrishnan, Johannes Gehrke, “Database Management Systems”, McGraw Hill, Third Edition 2004.
8. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Fourth Ediion, McGraw Hill, 2002.
9. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Pearson Education, 2004.

07NE15 ADVANCED JAVA TECHNOLOGY **3 0 0 100**

UNIT I **9**
JAVA FUNDAMENTALS

Java Virtual Machine – Reflection – I/O Streaming – Filter And Pipe Streams – Byte Codes – Byte Code Interpretation – Dynamic Reflexive Classes – Threading – Java Native Interfaces – GUI Applications.

UNIT II **9**
NETWORK PROGRAMMING IN JAVA

Stream Customization – Sockets – Secure Sockets – Custom Sockets – UDP Datagrams – Multicast Sockets – URL Classes – Reading Data From The Server – Writing Data – Configuring The Connection – Reading The Header – Content Handlers – Telnet Application – Java Messaging Services.

UNIT III **9**
DISTRIBUTED COMPUTING IN JAVA

Remote Method Invocation – Activation Models – RMI Custom Sockets – Object Serialization – Call Back Model – RMI – IIOP Implementation – CORBA – IDL Technology – Naming Services – CORBA Programming Models – JAR File Creation.

UNIT IV **9**
MULTI – TIER APPLICATION DEVELOPMENT

Server Side Programming – Servlets – Session Management – Cookies – HTTP Communication – JDBC – Multimedia Data Handling – Java Media Framework – Enterprise Applications.

UNIT V **9**
MOBILE APPLICATION DEVELOPMENT

Mobile Information Device Profile – Deployment Of Mobile Objects – Foundation Profile – RMI Profile For Mobile Devices – Development Of Midlets – Mobile Networking Applications.

TOTAL : 45

REFERENCES

1. Elliotte Rusty Harold, "Java Network Programming", O'Reilly Publishers, 2000.
2. Cay S.Horstmann, Gary Cornell, "Core Java, Volume 1 And 2", 5th Edition, Pearson Education Publishers, 2003.
3. Topley, "J2ME In A Nutshell", O'Reilly Publishers, 2002.
4. Hunt, "Guide to J2EE Enterprise Java", Springer Publications, 2004.
5. Ed Roman, "Enterprise Java Beans", Wiley Publishers, 1998.
6. Avstin, "Advance Programming For The Java2 Platform" 'Pearson Education, 2001.

07NE16 GENETIC ALGORITHM AND ITS APPLICATIONS 3 0 0 100

UNIT I **9**

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

UNIT II **9**

Genetic technology: steady state algorithm - fitness scaling - inversion. Genetic programming - Genetic Algorithm in problem solving

UNIT III **9**

Genetic Algorithm in engineering and optimization-natural evolution –Simulated annealing and Tabu search .Genetic Algorithm in scientific models and theoretical foundations.

UNIT IV **9**

Implementing a Genetic Algorithm – computer implementation - low level operator and knowledge based techniques in Genetic Algorithm.

UNIT V

9

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

TOTAL : 45

REFERENCES

1. Melanie Mitchell, 'An introduction to Genetic Algorithm', Prentice-Hall of India, New Delhi, Edition: 2004
2. David.E.Golberg, 'Genetic algorithms in search, optimization and machine learning', Addision-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', Morgan Kauffmann Publishers Inc, San Francisco,California,1998.

07NE17 DIGITAL IMAGE PROCESSING 3 0 0 100

UNIT I **9**

DIGITAL IMAGE FUNDAMENTALS:

Elements of digital image processing systems, Elements of visual perception, psycho visual model, brightness, contrast, hue, saturation, mach band effect, Color image fundamentals -RGB,HSI models,

Image acquisition and sampling, Quantization, Image file formats, Two-dimensional convolution, correlation, and frequency responses.

UNIT II **9**

IMAGE TRANSFORMS:

1D DFT, 2D transforms – DFT, DCT, Discrete Sine, Walsh, Hadamard, Slant, Haar, KLT, SVD, Radon, and Wavelet Transform.

UNIT III **9**

IMAGE ENHANCEMENT AND RESTORATION:

Histogram modification and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contra harmonic filters, Homomorphic filtering, Color image enhancement. Image Restoration – degradation model, Unconstrained and Constrained restoration, Inverse filtering, Wiener filtering, Geometric transformations – spatial transformations, Gray-Level interpolation,

UNIT IV **9**

IMAGE SEGMENTATION AND RECOGNITION:

Edge detection. Image segmentation by region growing, region splitting and merging, edge linking, Morphological operators: dilation, erosion, opening, and closing. Image Recognition – Patterns and pattern classes, matching by minimum distance classifier, Statistical Classifier. Matching by correlation, Neural network application for image recognition.

UNIT V **9**

IMAGE COMPRESSION:

Need for image compression, Huffman, Run Length Encoding, Arithmetic coding, Vector Quantization, Block Truncation Coding. Transform Coding – DCT and Wavelet. Image compression standards.

Total: 45

REFERENCES:

1. Rafael C. Gonzalez, Richard E.Woods, 'Digital Image Processing', Pearson Education, Inc., Second Edition, 2004.
2. Anil K. Jain, 'Fundamentals of Digital Image Processing', Prentice Hall of India, 2002.
3. David Salomon : Data Compression – The Complete Reference, Springer Verlag New York Inc., 2nd Edition, 2001
4. Rafael C. Gonzalez, Richard E.Woods, Steven Eddins, ' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.
5. William K.Pratt, ' Digital Image Processing', John Wiley, NewYork, 2002.
6. Milman Sonka, Vaclav Hlavac, Roger Boyle, 'Image Processing, Analysis, and Machine Vision', Brooks/Cole, Vikas Publishing House, II ed., 1999.
7. Sid Ahmed, M.A., 'Image Processing Theory, Algorithms and Architectures', McGrawHill, 1995.
8. Lim, J.S., 'Two Dimensional Signal and Image Processing', Prentice-Hall, New Jersey, 1990.

07NE18 NEURAL NETWORKS AND APPLICATIONS **3 0 0 100**

UNIT I **9**

BASIC LEARNING ALGORITHMS:

Biological Neuron – Artificial Neural Model - Types of activation functions – Architecture: Feedforward and Feedback – Learning Process: Error Correction Learning –Memory Based Learning – Hebbian Learning – Competitive Learning - Boltzman Learning – Supervised and Unsupervised Learning – Learning Tasks: Pattern Space – Weight Space – Pattern Association – Pattern Recognition – Function Approximation – Control – Filtering - Beamforming – Memory – Adaptation - Statistical Learning Theory – Single Layer Perceptron – Perceptron Learning Algorithm – Perceptron Convergence Theorem – Least

Mean Square Learning Algorithm – Multilayer Perceptron – Back Propagation Algorithm – XOR problem – Limitations of Back Propagation Algorithm.

UNIT II **9**

RADIAL-BASIS FUNCTION NETWORKS AND SUPPORT VECTOR MACHINES:

RADIAL BASIS FUNCTION NETWORKS:

Exact Interpolator – Regularization Theory – Generalized Radial Basis Function Networks - Learning in Radial Basis Function Networks - Applications: XOR Problem – Image Classification.

SUPPORT VECTOR MACHINES:

Optimal Hyperplane for Linearly Separable Patterns and Nonseparable Patterns – Support Vector Machine for Pattern Recognition – XOR Problem - $\in$-insensitive Loss Function – Support Vector Machines for Nonlinear Regression

UNIT III **9**

ATTRACTOR NEURAL NETWORKS:

Associative Learning – Attractor Neural Network Associative Memory – Linear Associative Memory – Hopfield Network – Content Addressable Memory – Strange Attractors and Chaos - Error Performance of Hopfield Networks - Applications of Hopfield Networks – Simulated Annealing – Boltzmann Machine – Bidirectional Associative Memory – BAM Stability Analysis – Error Correction in BAMs - Memory Annihilation of Structured Maps in BAMS – Continuous BAMs – Adaptive BAMs – Applications

UNIT IV **9**

ADAPTIVE RESONANCE THEORY:

Noise-Saturation Dilemma - Solving Noise-Saturation Dilemma – Recurrent On-center –Off-surround Networks – Building Blocks of Adaptive Resonance – Substrate of Resonance Structural Details of Resonance Model – Adaptive Resonance Theory – Applications

UNIT V

9

SELF ORGANISING MAPS:

Self-organizing Map – Maximal Eigenvector Filtering – Sanger's Rule – Generalized Learning Law – Competitive Learning - Vector Quantization – Mexican Hat Networks - Self-organizing Feature Maps – Applications

Total: 45

REFERENCES:

1. Satish Kumar, "Neural Networks: A Classroom Approach", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2004.
2. Simon Haykin, "Neural Networks: A Comprehensive Foundation", 2ed., Addison Wesley Longman (Singapore) Private Limited, Delhi, 2001.
3. Martin T.Hagan, Howard B. Demuth, and Mark Beale, "Neural Network Design", Thomson Learning, New Delhi, 2003.
4. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques, Pearson Education (Singapore) Private Limited, Delhi, 2003.
5. S. Rajasekaran, G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms, Synthesis and Applications, Prentice –Hall of India, New Delhi,2003.

07NE19 NETWORK ROUTING ALGORITHMS **3 0 0 100**

UNIT I **9**
CIRCUIT SWITCHING NETWORKS

AT & T's Dynamic Routing Network, Routing in Telephone Network-Dynamic Non Hierarchical Routing-Trunk Status Map Routing-Real Time Network Routing, Dynamic Alternative Routing-Distributed Adaptive Dynamic Routing-Optimized Dynamic Routing

UNIT II **9**
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 and SNA Routing

UNIT III **9**
HIGH SPEED NETWORKS

Routing in optical networks-The optical layer, Node Designs, Network design and operation, Optical layer cost tradeoffs, Routing and wavelength assignment, Architectural variations, Routing in ATM networks-ATM address structure, ATM Routing, PNNI protocol, PNNI signaling protocol, Routing in the PLANET network and Deflection Routing.

UNIT IV **9**
MOBILE NETWORKS

Routing in Cellular Mobile Radio Communication networks-Mobile Network Architecture, Mobility management in cellular systems, 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.

UNIT V **9**
MOBILE AD-HOC NETWORKS (Manet)

Internet based mobile ad-hoc networking, communication strategies, 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), Quality of Service.

TOTAL : 45

REFERENCES

1. M. Steen strub, "Routing in Communication networks", Prentice Hall International, NewYork, 1995.
2. "Internetworking Technologies Handbook", Fourth 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 (3/e), TMH, 2004
5. William Stallings, "High Speed Networks TCP/IP and ATM Design Principles", Prentice Hall International, New York, 1998.
6. Mohammad Ilyas, "The Handbook of Ad hoc Wireless Networks" CRC Press, 2002.
7. Vijay K.Garg, "Wireless Network Evolution: 2G to 3G", Pearson Education, New Delhi, India, 2003.
8. Rajiv Ramaswami and Kumar N.Sivarajan, "Optical Networks",Morgan Kaufmann Publishers,1998.
9. Sumit Kasera and Pankaj sethi, "ATM Networks", Tata McGraw-Hill Publishing Company limited, New Delhi,2001.
10. IEEE Journal on Selected Areas in Communications, Special issue on Wireless Ad-hoc Networks, Vol. 17, No.8, 1999.
11. Scott. M. Corson, Joseph P. Macker, Gregory H. Cirincione, IEEE Internet Computing Vol.3, No. 4, July – August 1999.

12. Alder M.Scheideler.Ch. Annual ACM Symposium on Parallel Algorithms and Architectures, ACM, NewYork 1998.
13. http://www.cisco.com/univercd/cc/td/doc/cisintwk/ito_doc/
14. www.moment.cs.ucsb.edu

LIST OF ELECTIVES
SEMESTER III

07NE20 SIMULATION OF COMMUNICATION SYSTEMS & NETWORKS 3 0 0 100

UNIT I **9**

MODELLING 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 bursty channels, HF, Troposcatter and satellite channels, Switched telephone channels, Analog and Digital communication system models, Light wave system models.

UNIT II **9**

SIMULATION OF RANDOM VARIABLES AND RANDOM PROCESS

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

UNIT III **9**

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 of sampling method, estimation of power spectral density

UNIT IV **9**

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

UNIT V **9**

NETWORK OF QUEUES

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

TOTAL : 45

REFERENCES

1. M.C.Jeruchim,Philip Balaban and K.Sam Shanmugan, "Simulation of communication systems", Springer, 2nd Edition, 2002.
2. A.M.Law and W.David Kelton, "Simulation Modelling and analysis", 3rd Edition, Mc Graw Hill Inc., 1999.
3. J.F.Hayes, “Modeling and Analysis of Computer Communication networks (Applications of Communication Theory)”, Plenum Press, 1984.
4. Jerry Banks and John S.Carson and Barry L. Nelson, “Discrete-Event System Simulation”, 4th Edition, Prentice Hall Inc., 2004.

07NE21COMMUNICATION NETWORK SECURITY 3 0 0 100

UNIT I **9**

SYMMETRIC CIPHERS

Introduction – Services, Mechanisms and Attacks, OSI security Architecture, Model for network Security; Classical Encryption Techniques- Symmetric Cipher Model, Substitution Techniques, Transposition

Techniques, Product ciphers , Data Encryption Standard- Block Cipher Principles, Strength of DES, Differential and Linear Crypt Analysis, Block Cipher Design Principles, BlockCipher Modes of Operation,Stegnography;

UNIT II

ADVANCED ENCRYPTION STANDARD AND STREAM CIPHERS 9

Evaluation Criteria for AES, AES Cipher; Contemporary Symmetric Ciphers- Triple DES, Blowfish, RC5- Characteristics of Advanced Symmetric Block Ciphers, Stream ciphers based on LFSRs,RC4 Stream Cipher; Random Number Generation. Traffic Confidentiality, Key Distribution,

UNIT III 9

PUBLIC-KEY ENCRYPTION AND HASH FUNCTIONS

Public Key Cryptography and Key Management- RSA Algorithm and other public key cryptosystems-, Diffie-Hellman Key Exchange, Elliptic Curve arithmetic, Elliptic Curve Cryptography; Message Authentication and Hash Functions- Authentication Requirements, - MD5 Message Digest Algorithm; Secure Hash Algorithm, RIPEMD 160, HMAC; Digital Signatures and Authentication Protocols- Digital Signature Standards.

UNIT IV 9

NETWORK SECURITY PRACTICE

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

UNIT V 9

SYSTEM SECURITY

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

TOTAL : 45

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

07NE22 SATELLITE COMMUNICATION 3 0 0 100

UNIT I 9

ORBITAL MECHANICS

Kepler's laws of motion, Orbits, Orbit Equations, Orbit Description, Locating the Satellite in the Orbit and with Respect to Earth, Orbital Elements-Look Angle Determination and Visibility - Orbital Perturbations, Orbit Determination, Launch Vehicles, Orbital Effects in Communication System - Performance Attitude control; Satellite launch vehicles. Spectrum allocations for satellite systems.

UNIT II 9

SPACECRAFT SUB SYSTEMS AND EARTH STATION

Spacecraft Subsystems, Altitude and Orbit Control, Telemetry and Tracking, Power Systems, Communication Subsystems, Transponders, Antennas, Equipment Reliability, Earth Stations, Example of payloads of operating and planned systems.

UNIT III 9

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 Dispersal, propagation characteristics of fixed and mobile satellite links.

UNIT IV **9**

MULTIPLE ACCESS TECHNIQUES AND NETWORK ASPECTS

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

UNIT V **9**

SERVICES AND APPLICATIONS

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

TOTAL : 45

REFERENCES

1. Dennis Roddy, “Satellite Communications”, 3rd Edition, Mc Graw Hill International Editions, 2001.
2. Bruce R.Elbert, “Introduction to Satellite Communication” , Artech House Inc.,1999.
3. Timothy Pratt, Charles W. Bostian, Jeremy Allnutt, “Satellite Communications”, 2nd Edition, Wiley, John & Sons, 2002.
4. Wilbur L.Pritchard, Hendri G.Suyderhood, Robert A.Nelson, “Satellite Communication Systems Engineering”, 2nd Edition, Prentice Hall, New Jersey, 1993.
5. Tri T.Ha, "Digital satellite communication", 2nd Edition, McGraw Hill, New york,1990.

07NE23 NETWORK MANAGEMENT **3 0 0 100**

UNIT I **9**

FUNDAMENTALS OF COMPUTER NETWORK TEHNOLOGY

NetworkTopology, LAN,Network node components- Hubs,Bridges,Routers,Gateways,Switches, WAN,ISDN-Transmission Technology, Communications protocols and standards

UNIT II **9**

OSI NETWORK MANAGEMENT

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

UNIT III **9**

INTERNET MANAGEMENT(SNMP)

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

UNIT IV **9**

BROADBAND NETWORK MANAGEMENT

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

UNIT V **9**

NETWORK MANAGEMENT APPLICATIONS

Configuration management, Fault management, performance management, Event Correlation Techniques security Management, Accounting management, Report Management, Policy Based Management Service Level Management

TOTAL : 45

REFERENCES

1. Mani Subramanian, " Network Management Principles and practice ", Addison Wesly 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.

07NE24 INTERNET PROGRAMMING 3 0 0 100

UNIT I 9
INTRODUCTION

Introduction to the Internet and World Wide Web - World Wide Web Consortium (W3C) - History of the Internet History of the World Wide Web - History of SGML -*XML* Introduction to HyperText Markup Language - Editing HTML - Common Elements – Headers - Linking - Images - Unordered Lists - Nested and Ordered Lists - HTML Tables-Basic HTML Forms

UNIT II 9
DYNAMIC HTML

Dynamic HTML Object Model and Collections, Event Model, Filters and Transitions, Data Binding with Tabular Data Control, Dynamic HTML-Structured Graphics ActiveX Controls, Dynamic HTML-Path, Sequencer and Sprite ActiveX Controls.

UNIT III 9
JAVASCRIPT

JavaScript, Introduction to Scripting, Control Statements, Functions, Arrays, Objects.

UNIT IV 9
XML

Creating Markup with XML -Parsers and Well-formed XML Documents -Parsing an XML Document with msxml - Document Type Definition (DTD) - Document Type Declaration - Element Type Declarations - Attribute Declarations - Document Object Model - DOM Implementations - – DOM Components - path - XSL: Extensible Stylesheet Language Transformations (XSLT)

UNIT V 9
PERL, CGI AND PHP

Perl - String Processing and Regular Expressions - Form Processing and Business Logic - Server-Side Includes - Verifying a Username and Password - Using DBI to Connect to a Database -PHP - Form Processing and Business Logic --Connecting to a Database - Dynamic Content in PHP

TOTAL : 45

REFERENCES

1. Deitel H M , Deitel P J and Goldberg A B, Internet & World Wide Web How to Program, Prentice Hall of India -3rd Edition -2007
2. Deitel & Deitel XML How to Program, Pearson Education,2001
3. Negrino and Smith Javascript for the World Wide Web, 5th Edition, Peachpit Press 2003.
4. Deitel & Deitel Perl How to Program, Pearson Education, 2001
5. Benoit Marchal, XML by Example, 2nd Edition, Que/Sams 2002.

07NE25 E-COMMERCE TECHNOLOGY 3 0 0 100

UNIT I 9
INTRODUCTION

Infrastructure for Electronic Commerce - Networks - Packet Switched Networks - TCP/IP Internet protocol - Domain name Services - Web Service Protocols - Internet applications - Utility programs - Markup Languages - Web Clients and Servers - Intranets and Extranets - Virtual private Network.

UNIT II 9
CORE TECHNOLOGY

Electronic Commerce Models - Shopping Cart Technology - Data Mining - Intelligent Agents – Internet Marketing - XML and E-Commerce

UNIT III 9
ELECTRONIC PAYMENT SYSTEMS

Real world Payment Systems - Electronic Funds Transfer - Digital Payment -Internet Payment Systems – Micro Payments - Credit Card Transactions - Case Studies.

UNIT IV 9
SECURITY

Threats to Network Security - Public Key Cryptography - Secured Sockets Layer - Secure Electronic Transaction - Network Security Solutions - Firewalls.

UNIT V 9
INTER/INTRA ORGANIZATIONS ELECTRONIC COMMERCE

EDI - EDI application in business - legal, Security and Privacy issues - EDI and Electronic commerce - Standards - Internal Information Systems - Macro forces - Internal commerce - Workflow Automation and Coordination - Customization and Internal commerce - Supply chain Management.

TOTAL : 45

REFERENCES

1. Ravi Kalakota and Andrew B Whinston , Frontiers of Electronic commerce, Addison Wesley, 1996
2. Pete Loshin, Paul A Murphy , Electronic Commerce, 2nd Edition , Jaico Publishers,1996.
3. Joseph P T , S J,E-Commerce - An Indian Perspective, second edtion, Prentice Hall of India.2006.
4. David Whiteley, e - Commerce : Strategy, Technologies and Applications - McGraw Hill,2000

07NE26 REAL TIME AND EMBEDDED SYSTEMS 3 0 0 100

UNIT I 9
INTRODUCTION

Introduction to Embedded systems – Classification of Embedded Systems – Processors in the system – Memories - Power Source and Managing the Power Dissipation and Consumption, Real Time Clock, Watchdog - Timer Reset, Input, Output and I/O Ports, IO Buses and Interfaces, ADC and DAC. Linking and Interfacing Buses, Units of the Embedded System Hardware. Exemplary Embedded Systems, Embedded System-On-Chip (SOC) and VLSI Circuit.

UNIT II 9
RTOS

RTOS Programming tools – MicroC/OS-II - RTOS System Level Functions, Task Service Functions, Time Delay Functions, Memory Allocation, Semaphore, Mailbox and Queue Functions.

UNIT III 9

REAL TIME SYSTEMS
Coding for an Automatic Chocolate Vending Machine – Adaptive Cruise Control System – Smart Card.

UNIT IV **9**
REAL TIME SPECIFICATIONS

Design techniques – Real-time kernels – Inter-task communication and synchronization – Real –time memory management

UNIT V **9**
MULTI-PROCESSING SYSTEMS

Multiprocessing Systems - Hardware/Software integration- Real time Applications

TOTAL : 45

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.

07NE27 MULTIMEDIA COMPRESSION TECHNIQUES 3 0 0 100

UNIT I **9**
INTRODUCTION

Special features of Multimedia – Graphics and Image Data Representations – Fundamental Concepts in Video and Digital Audio – Storage requirements for multimedia applications -Need for Compression - Taxonomy of compression techniques – Overview of source coding, source models, scalar and vector quantization theory – Evaluation techniques – Error analysis and methodologies

UNIT II **9**
TEXT COMPRESSION

Compaction techniques – Huffmann coding – Adaptive Huffmann Coding – Arithmetic coding – Dictionary techniques – LZW family algorithms.

UNIT III **9**
AUDIO COMPRESSION
Audio compression techniques - μ- Law and A- Law companding. Frequency domain and filtering – Basic sub-band coding – Application to speech coding – G.722 – Application to audio coding – MPEG audio, progressive encoding for audio – Silence compression, speech compression techniques – Formant and CELP Vocoders

UNIT IV **9**
IMAGE COMPRESSION
Predictive techniques – DM, PCM, DPCM: Optimal Predictors and Optimal Quantization– Transform Coding – JPEG Standard – Sub-band coding algorithms: Design of Filter banks – Wavelet based compression: Implementation using filters – EZW, SPIHT coders – JPEG 2000 standards.

UNIT V **9**
VIDEO COMPRESSION

Video compression techniques and standards – MPEG Video Coding I: MPEG – 1 and 2 – MPEG Video Coding II: MPEG – 4 and 7 – Motion estimation and compensation techniques – H.261 Standard.

Total: 45

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, NewYork, 1995

07NE28 INFORMATION THEORY AND CODING 3 0 0 100

UNIT I **5**

Introduction to Probability theory, random variables

UNIT II **10**

RANDOM PROCESS :: Classification - Stationarity - Spectral decomposition - Response of linear system to random inputs

UNIT III **10**

MEMORYLESS FINITE SCHEMES: Self information measure - Entropy function - Conditional Entropies - Characteristics of Entropy function - Derivation of the noise characteristics of a channel - Mutual information - Redundancy - Efficiency and channel capacity - capacities of channels with symmetric noise structure.

UNIT IV **10**

CONTINUOUS CHANNELS: Definitions of different entropies - Mutual information - Maximization of the entropy of a continuous random variable - Entropy maximization problems - Channel capacity under the influence of additive white Gaussian Noise.

UNIT V **10**

ELEMENTS OF ENCODING: Separable binary codes - Shannon - Fano encoding - Necessary and sufficient conditions for noiseless coding - Shannon's binary coding - fundamental theorem of discrete noise-less coding - Huffman's code - Gilbert Moore coding - Fundamental theorem of discrete coding in presence of noise - Error-detecting and error-correcting codes - Hamming's single error correcting code.

Total: 45

REFERENCES:

1. Viterbei A & Omura J.K, "Principles of Digital Communication and Coding", McGraw Hill, 1979.
2. Satyanarayana P.S. "Probability Theory - An Introduction", Dayaram Publications" 1990.
3. Mansuripur.M.A, "Introduction to Information Theory" - Prentice Hall Inc. 1990.
4. Srinath .M.D and Rajasekaran .P.K "An Introduction to Statistical Signal Processing with Application, Prentice Hall, 1993.
5. Joya Thomas, M.Cover "Elements of Information theory", John Wiley, 1991.
6. Richard.B.wells, "Applied Coding and Information Theory for Engineers", Prentice Hall, 1998.

07NE29 NETWORK SYSTEM DESIGN USING NETWORK PROCESOR 3 0 0 100

UNIT I **9**

INTRODUCTION - PROTOCOLS AND PACKET FORMATS: Network systems and the Internet, Applications, packet processing, protocols and layering, layer 1 and 2, layer 3, layer 4, protocol port numbers and de-multiplexing, Encapsulation and transmission. (6)

UNIT II **9**

PACKET PROCESSING: Introduction, packet buffer allocation, packet buffer size and copying, protocol layering and copying, Heterogeneity and network byte order, IP datagram fragmentation and reassembly, IP forwarding algorithm,

UNIT III **9**

TCP ALGORITHM:

TCP connection recognition algorithm, TCP splicing algorithm, Functions – Address lookup and packet forwarding, error detection and correction, Fragmentation, segmentation and reassembly, frame and protocol de-multiplexing, packet classification, queuing and packet discard, Scheduling and timing, Authentication and privacy, traffic measurement and policing , traffic shaping, timer management.

UNIT IV **9**

NETWORK PROCESSORS: Introduction, motivation for embedded processors, RISC Vs CISC, need for custom silicon, definition of NP, flexibility through programmability, instruction set, scalability with parallelism and pipelining, cause and benefits of NP, NP functionality, packet processing functions, Ingress and Egress processing, Parallel and distributed architecture, architectural roles of NP, NP architectures – Introduction, architectural variety, primary architectural characteristics, Architecture, packet flow and clock rates, software architecture, assigning functionality to the process hierarchy, issues in scaling an NP.

UNIT V **9**

IXP2XXX: Introduction, IXP2xxx Architecture, Micro engines, Programming Models, Packet processing in a single thread, Advanced programming, Applications: Switches, Routers, Firewall, and Active Networks.

Total:45

REFERENCES:

1. Douglas E.Comer, "Network Systems Design using Network Processors", Intel IXP version,, Pearson Education. March 2003
2. Erik J. Johnson and Aaron Kunze, "IXP 2400/2800 Programming", Intel Press, April 2003
3. Uday R. Naik and Prashant R. Chandra, " Designing High Performance Networking Applications – Essential Insights for Developers of IXP2XXX Network Processor Based Systems", Intel Press, November 2004
4. Donald F. Hooper, " Using IXP2400/2800 Development Tools – A Hands on Approach to Network Processor Software Design", Intel Press, August 2004
5. Patrick Crowley, Peter Z. Onufryk, Mark A. Franklin, Haldun Hadimioglu, "Network Processors 2002: Design Principles and Practices", Vol 1, Morgan Kaufmann Publications, September 2002.
6. Mark A. Franklin, Patrick Crowley, Haldun Hadimioglu, Peter Z. Onufryk "Network Processor Design: Issues and Practices", Vol 2, Academic Press, December 2003.
7. Panos C. Lekkas, "Network Processors: Architectures, Protocols and Platforms (Telecom Engineering"), McGraw Hill, July 2003

07NE30 WIRELESS SENSOR NETWORKS **3 0 0 100**

UNIT I **9**

INTRODUCTION

Over view of sensor networks- Constraints and challenges – Advantages of sensor networks- Applications- Collaborative processing – Key definitions in sensor networks – Tracking scenario – Problem formulation – Distributed representation and interference of states – Tracking multiple objects – sensor models- Performance comparison and metrics.

UNIT II **9**

NETWORKING SENSORS

Key assumption - Medium access control – S-MAC protocol – IEEE 802.15.4 standard and ZigBee - General Issues - Geographic, Energy – Aware Routing - Attribute based routing.

UNIT III **9**

INFRASTRUCTURE ESTABLISHMENT

Topology control – Clustering -Time Synchronization – Localization – Task driven sensing – Role of sensor nodes – Information based tasking - Routing and aggregation.

UNIT IV **9**

SENSOR NETWORK DATABASE

Sensor Database Challenges – Querying the physical environment – Interfaces – In-network aggregation – Data centric storage – Data indices and range queries – Distributed Hierarchical aggregation – Temporal data.

UNIT V **9**

SENSOR NETWOR PLATFORMS AND TOOLS

Sensor Node Hardware – Sensor network programming challenges – Node level software platforms – Operating system TinyOS – Node level simulators – State centric programming – Applications and future directions.

Total: 45

REFERENCE:

1. Feng Zhao, Leonidas Guibas, "Wireless sensor networks an information processing approach", Mogan kanufmann publishers, 2004

07NE31 RF MEMS **3 0 0 100**

UNIT I **9**

SWITCHING

RF MEMS relays and switches: Switch parameters, Actuation mechanisms, Bistable relays and micro actuators, Dynamics of switching operation.

UNIT II **9**

COMPONENTS - I

MEMS inductors and capacitors: Micromachined inductor, Effect of inductor layout, Modeling and design issues of planar inductor, Gap tuning and area tuning capacitors, Dielectric tunable capacitors.

UNIT III **9**

COMPONENTS - II

MEMS phase shifters: Types. Limitations, Switched delay lines, Micromachined transmission lines, coplanar lines, Micromachined directional coupler and mixer.

UNIT IV **9**

FILTERS

Micromachined RF filters: Modeling of mechanical filters, Electrostatic comb drive, Micromechanical filters using comb drives, Electrostatic coupled beam structures.

UNIT V **9**

ANTENNAS

Micromachined antennas: Microstrip antennas – design parameters, Micromachining to improve performance, Reconfigurable antennas.

Total: 45

REFERENCES:

1. V.K.Varadan etal, RFMEMS and their Applications, Wiley, 2003.
2. H.J.DELOS SANTOS : RF MEMS circuit Design for Wireless Communications, Artech House, 2002.
3. G.M.REBEIZ, RF MEMS Theory, Design and Technology, John Wiley, 2003.