

# AFFILIATED INSTITUTIONS

ANNA UNIVERSITY, CHENNAI

## REGULATIONS 2009

CURRICULUM AND SYLLABUS I TO VI SEMESTERS (PART TIME)

M.E. DIGITAL COMMUNICATIONS AND NETWORKING

### SEMESTER – I

Code No.	Course Title	L	T	P	C
<b>Theory</b>					
MA9330	<a href="#">Applied mathematics for Electronics Engineers</a>	3	1	0	4
EC9002	<a href="#">Data communication Networks</a>	3	0	0	3
DI9312	<a href="#">Modern Digital Communication Techniques</a>	3	0	0	3
<b>Practical</b>					
DI9316	<a href="#">Digital Communication and Networks Lab I</a>	0	0	4	2
<b>TOTAL</b>		<b>9</b>	<b>1</b>	<b>4</b>	<b>12</b>

### SEMESTER – II

Code No.	Course Title	L	T	P	C
<b>Theory</b>					
NE9222	<a href="#">High Speed Networks</a>	3	0	0	3
EC9001	<a href="#">Mobile and Personal Communications</a>	3	0	0	3
CU9254	<a href="#">Digital Communication Receivers</a>	3	0	0	3
<b>Practical</b>					
DI9321	<a href="#">Digital Communication and Networks Lab II</a>	0	0	4	2
<b>TOTAL</b>		<b>9</b>	<b>0</b>	<b>4</b>	<b>11</b>

### SEMESTER – III

Code No.	Course Title	L	T	P	C
<b>Theory</b>					
DI9313	<a href="#">Advanced Digital Signal Processing</a>	3	1	0	4
DI9314	<a href="#">Wireless Communication Networks</a>	3	0	0	3
E1***	Elective I	3	0	0	3
<b>TOTAL</b>		<b>9</b>	<b>1</b>	<b>0</b>	<b>10</b>

### SEMESTER – IV

Code No.	Course Title	L	T	P	C
EC9005	<a href="#">High Performance Communication Networks</a>	3	0	0	3
E2***	Elective II	3	0	0	3
E3***	Elective III	3	0	0	3
<b>TOTAL</b>		<b>9</b>	<b>0</b>	<b>0</b>	<b>9</b>

**SEMESTER – V**

Code No.	Course Title	L	T	P	C
<b>Theory</b>					
E4***	Elective IV	3	0	0	3
E5***	Elective V	3	0	0	3
E6***	Elective VI	3	0	0	3
<b>Practical</b>					
DI9331	Project Work (Phase I)	0	0	12	6
<b>TOTAL</b>		<b>9</b>	<b>0</b>	<b>12</b>	<b>15</b>

**SEMESTER – VI**

Code No.	Course Title	L	T	P	C
DI9341	Project Work (Phase II)	0	0	24	12
<b>TOTAL</b>		<b>0</b>	<b>0</b>	<b>24</b>	<b>12</b>

**LIST OF ELECTIVES  
M.E. DIGITAL COMMUNICATIONS AND NETWORKING**

Code No.	Course Title	L	T	P	C
AP9251	<a href="#">Digital Image Processing</a>	3	0	0	3
AP9252	<a href="#">Neural Networks and Applications</a>	3	0	0	3
CP9253	<a href="#">High Speed, Switching Architecture</a>	3	0	0	3
NI9321	<a href="#">Network Management</a>	3	0	0	3
EC9016	<a href="#">Network Routing Algorithms</a>	3	0	0	3
NE9266	<a href="#">Simulation of Communication Systems and Networks</a>	3	0	0	3
DI9003	<a href="#">Communication Network Security</a>	3	0	0	3
CU9255	<a href="#">Internetworking Multimedia</a>	3	0	0	3
DI9005	<a href="#">Internet Programming</a>	3	0	0	3
VL9261	<a href="#">ASIC Design</a>	3	0	0	3
DI9006	<a href="#">Advanced Java Technology</a>	3	0	0	3
NE9256	<a href="#">Genetic Algorithms and Applications</a>	3	0	0	3
NE9257	<a href="#">Multimedia Compression techniques</a>	3	0	0	3
ET9263	<a href="#">Adhoc Networks</a>	3	0	0	3
EC9011	<a href="#">Speech and Audio Signal Processing</a>	3	0	0	3
EC9013	<a href="#">Satellite Communication</a>	3	0	0	3
DI9007	<a href="#">Multimedia Databases</a>	3	0	0	3
DI9008	<a href="#">Cellular Mobile Communication</a>	3	0	0	3
	Special Electives	3	0	0	3

**UNIT I REAL AND COMPLEX VARIABLES 9**

Convergent and divergent series. Tests for convergence. Power series; interval of convergence. McLaurin series and Taylor series. Complex power series – circle of convergence. Euler's formula. Power and roots of complex numbers. Analytic functions. Contour integrals. Laurent series. Residue theorem. Method of finding residues. Evaluation of definite integrals by residue theorem. Conformal mapping and applications. Complex analysis applied to potential theory.

**UNIT II PARTIAL DIFFERENTIATION AND MULTIPLE INTEGRALS 9**

Power series in two variables. Total differential. Chain rule. Maximum and Minimum problems. Constraints and method of Lagrange multipliers. Change of variables. Differentiation of integrals; Leibnitz rule. Double and triple integrals. Change of order and change of variables in integrals; Jacobian. Application of multiple integrals.

**UNIT III ORDINARY DIFFERENTIAL EQUATIONS 9**

First order equations. Separable equations. Exact differential equations. Integrating factors. Equations of second and higher orders. Homogeneous equations with constant coefficients. Non-homogeneous equations. Series solution of differential equations. Method of Frobenius. Solution of Bessel's equation. Bessel functions.

**UNIT IV VECTOR CALCULUS 9**

Rectangular, cylindrical and spherical co-ordinate system. Unit vectors. Elemental length, area and volume. Scale factors. Representation of vectors in different co-ordinate systems. Conversion from one system to the other. Differentiation of vectors. Meaning of Line, Surface and Volume integrals. Definition of curl and divergence in terms of Line and Surface integrals. Meaning of Stokes' theorem and Divergence theorem. Definition of directional derivatives and gradient for level surfaces. Green's theorem in the plane. Expression for curl, divergence, gradient and the Laplacian in generalized co-ordinate system.

**UNIT V PROBABILITY AND RANDOM VARIABLES 9**

Data representation – average, spread. Definition of probability and probability theorems. Methods of counting. Random variables, probability distributions. Binomial, Gaussian and Poisson distributions. Distribution of several random variables. Random sampling. Estimation of parameters. Confidence intervals.  $X^2$  test. Regression analysis. Fitting of straight lines.

**L -45 T-15 ,TOTAL -60 PERIODS**

**REFERENCES:**

1. Boas, M.L. "Mathematical Methods in Physical Sciences"., Wiley 2002
2. Kreyszig, E. "Advanced Engineering Mathematics"., Wiley 2001.
3. Anton, H., Bivens, I., Davis, S., "Calculus"., Wiley 2002.
4. Spiegel, "Advanced Calculus"., Schaum Series, TMH 1990.
5. Bronson, R., "Differential Equations"., Schaum series, TMH, 2004

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

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 DATA LINK LAYER****9**

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 NETWORK LAYER****9**

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 TRANSPORT LAYER****9**

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

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 PERIODS****REFERENCES :**

1. Forouzan : Data Communications and Networking, TMH, 3<sup>rd</sup> Edition, 2004.
2. William Stallings : Data and Computer Communications, PHI, 7<sup>th</sup> 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, 4<sup>th</sup> Edition, Pearson Education Asia Inc., 2004.
6. Leon-Garcia, Widjaja : Communication Networks, Fundamental Concepts and Key Architecture, TMH, 2<sup>nd</sup> Edition, 2004.
7. Gerd E.Keiser : Local Area Networks, TMH, 2<sup>nd</sup> Edition, 2002

**UNIT I POWER SPECTRUM AND COMMUNICATION OVER MEMORYLESS CHANNEL: 9**

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.

**UNIT II COHERENT AND NON-COHERENT COMMUNICATION: 9**

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 III BANDLIMITED CHANNELS AND DIGITAL MODULATIONS: 9**

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.

**UNIT IV BLOCK CODED DIGITAL COMMUNICATION: 9**

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..

**UNIT V CONVOLUTIONAL CODED DIGITAL COMMUNICATION: 9**

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.

**TOTAL: 45 PERIODS****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, 4<sup>th</sup> Edition Pearson Education Asia, 1998
4. B.P.Lathi Modern digital and analog communication systems, 3<sup>rd</sup> Edition, Oxford University press 1998.

**DI9316 DIGITAL COMMUNICATION AND NETWORKS  
LABORATORY I****L T P C  
0 0 4 2**

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

**UNIT I HIGH SPEED NETWORKS 9**

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 CONGESTION AND TRAFFIC MANAGEMENT 9**

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 TCP AND ATM CONGESTION CONTROL 9**

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 INTEGRATED AND DIFFERENTIATED SERVICES 9**

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

**UNIT V PROTOCOLS FOR QOS SUPPORT 9**

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

**TOTAL : 45 PERIODS****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. Ivan Pepelnjk, Jim Guichard, Jeff Apcar, "MPLS and VPN Architecture", Cisco Press, Volume 1 and 2, 2003.

**EC9001 MOBILE AND PERSONAL COMMUNICATIONS L T P C  
3 0 0 3****UNIT I INTRODUCTION TO MOBILE AND PERSONAL COMMUNICATION 9**

History of wireless communications, Mobile and Personal communications: Past, present and future, 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 PROPAGATION ISSUES 9**

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 ANTENNA SYSTEMS 9**

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 PERSONAL COMMUNICATION SYSTEMS (PCS) 9**

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 UNIVERSAL PERSONAL TELECOMMUNICATION (UPT) 9**

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.

**CU9254 DIGITAL COMMUNICATION RECEIVERS L T P C  
3 0 0 3**

**UNIT I REVIEW OF DIGITAL COMMUNICATION TECHNIQUES 9**

Base band and band pass communication, signal space representation, linear and non- linear modulation techniques, and spectral characteristics of digital modulation.

**UNIT II OPTIMUM RECEIVERS FOR AWGN CHANNEL 9**

Correlation demodulator, matched filter, maximum likelihood sequence detector, Optimum receiver for CPM signals, M-ary orthogonal signals, envelope detectors for M-ary and correlated binary signals.

**UNIT III RECEIVERS FOR FADING CHANNELS 9**

Characterization of fading multiple channels, statistical models, slow fading, frequency selective fading, diversity technique, RAKE demodulator, coded waveform for fading channel

**UNIT IV SYNCHRONIZATION TECHNIQUES 9**

Carrier and symbol synchronization, carrier phase estimation – PLL, Decision directed loops, symbol timing estimation, maximum likelihood and non-decision directed timing estimation, joint estimation.

**UNIT V ADAPTIVE EQUALIZATION 9**

Zero forcing algorithm, LMS algorithm, Adaptive decision – feedback equalizer, and equalization of Trellis-coded signals, Kalman algorithm, blind equalizers, and stochastic gradient algorithm, Echo cancellation

**TOTAL : 45 PERIODS**

**REFERENCES**

- 1) Heinrich Meyer, Mare Moeneclacy, Stefan.A. Fechtel, "Digital Communication Receivers", Vol I & II, John Wiley, New York, 1997
- 2) John. G. Proakis, "Digital Communication", 4<sup>th</sup> Edition., McGraw Hill, NewYork, 2001
- 3) E.A. Lee and D.G. Messerschmitt, "Digital Communication", 2<sup>nd</sup> Edition, Allied Publishers, New Delhi, 1994
- 4) Simon Marvin, "Digital Communication Over Fading channel; An unified approach to performance Analysis", John Wiley, New York, 2000
- 5) Bernard Sklar, "Digital Communication Fundamentals and Applications, Prentice Hall, 1998

**DI9321 DIGITAL COMMUNICATION AND NETWORK LAB II L T P C  
3 0 0 3**

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 Data encryption and decryption.
7. Performance evaluation of CDMA Systems
8. Simulation of IEEE 802.11 MAC protocol

**TOTAL : 45 PERIODS**

**DI9313 ADVANCED DIGITAL SIGNAL PROCESSING L T P C  
3 0 0 3**

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

**UNIT I DISCRETE RANDOM SIGNAL PROCESSING 9**

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 SPECTRUM ESTIMATION 9**

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 LINEAR ESTIMATION AND PREDICTION 9**

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 ADAPTIVE FILTERS 9**

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 MULTIRATE DIGITAL SIGNAL PROCESSING 9**

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)

**DI9314 WIRELESS COMMUNICATION NETWORKS L T P C  
3 0 0 3**

**UNIT I WIRELESS MEDIUM: 9**

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 WIRELESS MEDIUM ACCESS: 9**

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

**UNIT III WIRELESS NETWORK OPERATION: 9**

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 WIRELESS WAN: 9**

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 WIRELESS LANS AND HIPERLANS: 9**

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 PERIODS**

**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”, Prentice Hall, 2002

**EC9005 HIGH PERFORMANCE COMMUNICATION NETWORKS L T P C  
3 0 0 3**

**UNIT I PACKET SWITCHED NETWORKS 9**

OSI and IP models, Ethernet (IEEE 802.3), Token ring (IEEE 802.5), Wireless LAN (IEEE 802.11) FDDI, DQDB, SMDS: Internetworking with SMDS

**UNIT II ISDN AND BROADBAND ISDN 9**

ISDN - overview, interfaces and functions, Layers and services - Signaling System 7 - Broadband ISDN architecture and Protocols.

**UNIT III ATM AND FRAME RELAY 9**

ATM: Main features-addressing, signaling and routing, ATM header structure-adaptation layer, management and control, ATM switching and transmission. Frame Relay: Protocols and services, Congestion control, Internetworking with ATM, Internet and ATM, Frame relay via ATM.

**UNIT IV ADVANCED NETWORK ARCHITECTURE 9**

IP forwarding architectures overlay model, Multi Protocol Label Switching (MPLS), integrated services in the Internet, Resource Reservation Protocol (RSVP), Differentiated services

**UNIT V BLUE TOOTH TECHNOLOGY 9**

The Blue tooth module-Protocol stack Part I: Antennas, Radio interface, Base band, The Link controller, Audio, The Link Manager, The Host controller interface; The Blue tooth module-Protocol stack Part I: Logical link control and adaptation protocol, RFCOMM, Service discovery protocol, Wireless access protocol, Telephony control protocol.

**TOTAL : 45 PERIODS**

**REFERENCES**

1. William Stallings, “ISDN and Broadband ISDN with Frame Relay and ATM”, 4<sup>th</sup> Edition, Pearson education asia, 2002.
2. Leon Gracia, Widjaja, “Communication networks”, Tata McGraw-Hill, New Delhi, 2000.
3. Jennifer Bray and Charles F.Sturman, “Blue Tooth” Pearson education Asia, 2001.
4. Sumit Kasera, Pankaj Sethi, “ATM Networks”, Tata McGraw-Hill, New Delhi, 2000.
5. Rainer Handel, Manfred N.Huber, Stefan Schroder, “ATM Networks”, 3<sup>rd</sup> Edition, Pearson education asia, 2002.
6. Jean Walrand and Pravin varaiya, “High Performance Communication networks”, 2<sup>nd</sup> Edition, Harcourt and Morgan Kauffman, London, 2000..
7. William Stallings, “High-speed Networks and Internets”, 2<sup>nd</sup> Edition, Pearson education Asia, 2003.

**UNIT I DIGITAL IMAGE FUNDAMENTALS: 9**

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 sampling, Quantization, dither, Two-dimensional mathematical preliminaries.

**UNIT II IMAGE TRANSFORMS: 9**

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

**UNIT III IMAGE ENHANCEMENT AND RESTORATION: 9**

Histogram modification and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contraharmonic and Yp mean filters, Homomorphic filtering, Color image enhancement. Image Restoration – degradation model, Unconstrained and Constrained restoration, Inverse filtering – removal of blur caused by uniform linear motion, Wiener filtering, Geometric transformations – spatial transformations, Gray-Level interpolation,

**UNIT IV IMAGE SEGMENTATION AND RECOGNITION: 9**

Edge detection. Image segmentation by region growing, region splitting and merging, edge linking.. Image Recognition – Patterns and pattern classes, Matching by minimum distance classifier, Matching by correlation, Back Propagation Neural Network, Neural Network applications in Image Processing.

**UNIT V IMAGE COMPRESSION: 9**

Need for data compression, Huffman., Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Block Truncation Coding. Transform Coding – DCT and Wavelet. JPEG ,MPEG. Standards, Concepts of Context based Compression.

**TOTAL : 45 PERIODS****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., 2<sup>nd</sup> 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.

**UNIT I BASIC LEARNING ALGORITHMS: 9**

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:



**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.

**CP9253****HIGH SPEED SWITCHING ARCHITECTURE****L T P C  
3 0 0 3****UNIT I HIGH SPEED NETWORK****9**

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 LAN SWITCHING TECHNOLOGY****9**

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

**UNIT III ATM SWITCHING ARCHITECTURE****9**

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 QUEUES IN ATM SWITCHES****9**

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

**UNIT V IP SWITCHING****9**

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 PERIODS****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, 3<sup>rd</sup> Edition, Adisson Wesley, New York,1999.
4. John A.Chiong: Internetworking ATM for the internet and enterprise networks. McGraw Hill, New York, 1998.

**NI9321****NETWORK MANAGEMENT****L T P C  
3 0 0 3****UNIT I FUNDAMENTALS OF COMPUTER NETWORK TEHNOLOGY****9**

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

**UNIT II OSI NETWORK MANAGEMENT 9**

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

**UNIT III INTERNET MANAGEMENT(SNMP) 9**

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

**UNIT IV BROADBAND NETWORK MANAGEMENT 9**

Broadband network s 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 ILMlin ATM Management,M1,M2,M3,M4 Interface.ATM Digital Exchange Interface Management

**UNIT V NETWORK MANAGEMENT APPLICATIONS 9**

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

**TOTAL : 45 PERIODS**

**REFERENCES**

1. Mani Subramanian, " Network Management Principles and practice ", Addison Wesley New York, 2000.
2. Salah Aaidarous, 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.

**EC9016 NETWORK ROUTING ALGORITHMS L T P C 3 0 0 3**

**UNIT I CIRCUIT SWITCHING NETWORKS 9**

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 PACKET SWITCHING NETWORKS 9**

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 HIGH SPEED NETWORKS 9**

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 MOBILE NETWORKS 9**

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 MOBILE AD-HOC NETWORKS (Manet) 9**

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 PERIODS****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/](http://www.cisco.com/univercd/cc/td/doc/cisintwk/ito_doc/)
14. [www.moment.cs.ucsb.edu](http://www.moment.cs.ucsb.edu)

**NE9266 SIMULATION OF COMMUNICATION SYSTEMS & NETWORKS L T P C  
3 0 0 3****UNIT I MODELLING OF COMMUNICATION SYSTEM 9**

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

**UNIT II SIMULATION OF RANDOM VARIABLES AND RANDOM PROCESS 9**

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

**UNIT III ESTIMATION OF PERFORMANCE MEASURES 9**

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

**UNIT IV COMMUNICATION NETWORKS 9**

Queuing models, M/M/1 and M/M/1/N queues, Little formula, Burke's theorem ,M/G/1 queue, Embedded Markov chain analysis of TDM systems, Polling, Random access systems

**UNIT V NETWORK OF QUEUES 9**

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

**TOTAL : 45 PERIODS**

**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

**DI9003 COMMUNICATION NETWORK SECURITY L T P C  
3 0 0 3**

**UNIT I SYMMETRIC CIPHERS (Techniques and Standards) – I 9**

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

**UNIT II SYMMETRIC CIPHERS (Techniques and Standards) – II 9**

Advanced Encryption Standard- Evaluation Criteria for AES, AES Cipher; Contemporary Symmetric Ciphers- Triple DES, Blowfish, RC5, Characteristics of Advanced Symmetric Block Ciphers, RC4 Stream Cipher; Confidentiality using Symmetric Encryption- Placement of Encryption Function, Traffic Confidentiality, Key Distribution, and Random Number Generation.

**UNIT III PUBLIC-KEY ENCRYPTION AND HASH FUNCTIONS 9**

Public Key Cryptography and RSA- Principles of Public Key Cryptosystems, RSA Algorithm; Key Management and other public key cryptosystems- Key Management, Diffie-Hellman Key Exchange, Elliptic Curve arithmetic, 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, RIPEMD 160, HMAC; Digital Signatures and Authentication Protocols- Digital Signatures, Authentication Protocols, Digital Signature Standards.



**UNIT IV NETWORK SECURITY PRACTICE 9**

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.

**UNIT V SYSTEM SECURITY 9**

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

**TOTAL : 45 PERIODS**

**REFERENCES**

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

**CU9255**

**INTERNETWORKING MULTIMEDIA**

**L T P C  
3 0 0 3**

**UNIT I MULTIMEDIA NETWORKING 9**

Digital sound, video and graphics, basic multimedia networking, multimedia characteristics, evolution of Internetservices model, network requirements for audio/video transform, multimedia coding and compression for text, image, audio and video.

**UNIT II BROADBAND NETWORK TECHNOLOGY 9**

Broadband services, ATM and IP, IPV6, High speed switching, resource reservation, Buffer management, traffic shaping, caching, scheduling, and policing, throughput, delay and jitter performance. Storage and media services, voice and video over IP, MPEG-2 over ATM/IP, indexing synchronization of requests, recording and remote control.

**UNIT III RELIABLE TRANSPORT PROTOCOL AND APPLICATIONS 9**

Multicast over shared media network, multicast routing and addressing, scaling multicast and NBMA networks, Reliable transport protocols, TCP adaptation algorithm, RTP, RTCP. MIME, Peer- to-Peer computing, shared application, video conferencing, centralized and distributed conference control, distributed virtual reality, light weight session philosophy.

**UNIT IV MULTIMEDIA COMMUNICATION STANDARDS 9**

Objective of MPEG- 7 standard, Functionalities and systems of MPEG-7, MPEG-21 Multimedia Framework Architecture, - Content representation, Content Management and usage, Intellectual property management, Audio visual system- H322: Guaranteed QOS LAN systems; MPEG\_4 video Transport across internet.

**UNIT V MULTIMEDIA COMMUNICATION ACROSS NETWORKS 9**

Packet Audio/video in the network environment, video transport across Generic networks- Layered video coding, error Resilient video coding techniques, Scalable Rate control, Streaming video across Internet, Multimedia transport across ATM networks and IP network, Multimedia across wireless networks.

**TOTAL : 45 PERIODS**

## REFERENCES

1. Jon Crowcroft, Mark Handley, Ian Wakeman, Internetworking Multimedia, Harcourt Asia Pvt. Ltd. Singapore, 1998.
2. B.O. Szuprowicz, Multimedia Networking, McGraw Hill, Newyork. 1995
3. Tay Vaughan, Multimedia making it to work, 4ed, Tata McGraw Hill , NewDelhi, 2000.
4. K.R.Rao, Zoran S. Bojkovic and Dragorad A. Milovanovic, Multimedia Communication systems, PHI , 2003 ( Unit 4 and Unit 5)

**DI9005**

**INTERNET PROGRAMMING**

**L T P C**  
**3 0 0 3**

### **UNIT I INTRODUCTION 9**

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 DYNAMIC HTML 9**

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 JAVASCRIPT 9**

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

### **UNIT IV XML 9**

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 PERL, CGI AND PHP 9**

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 PERIODS**

## REFERENCES

1. Deitel & Deitel Internet & World Wide Web How to Program, Pearson Education India -3<sup>rd</sup> Edition -2004
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, 2<sup>nd</sup> Edition, Que/Sams 2002.

**UNIT I INTRODUCTION TO ASICs, CMOS LOGIC AND ASIC LIBRARY DESIGN 9**

Types of ASICs - Design flow - CMOS transistors CMOS Design rules - Combinational Logic Cell – Sequential logic cell - Data path logic cell - Transistors as Resistors - Transistor Parasitic Capacitance- Logical effort –Library cell design - Library architecture .

**UNIT II PROGRAMMABLE ASICs, PROGRAMMABLE ASIC LOGIC CELLS AND PROGRAMMABLE ASIC I/O CELLS 9**

Anti fuse - static RAM - EPROM and EEPROM technology - PREP benchmarks - Actel ACT - Xilinx LCA –Altera FLEX - Altera MAX DC & AC inputs and outputs - Clock & Power inputs - Xilinx I/O blocks.

**UNIT III PROGRAMMABLE ASIC INTERCONNECT, PROGRAMMABLE ASIC DESIGN SOFTWARE AND LOW LEVEL DESIGN ENTRY 9**

Actel ACT -Xilinx LCA - Xilinx EPLD - Altera MAX 5000 and 7000 - Altera MAX 9000 - Altera FLEX –Design systems - Logic Synthesis - Half gate ASIC -Schematic entry - Low level design language - PLA tools -EDIF- CFI design representation.

**UNIT IV LOGIC SYNTHESIS, SIMULATION AND TESTING 9**

Verilog and logic synthesis -VHDL and logic synthesis - types of simulation -boundary scan test - fault simulation - automatic test pattern generation.

**UNIT V ASIC CONSTRUCTION, FLOOR PLANNING, PLACEMENT AND ROUTING 9**

System partition - FPGA partitioning - partitioning methods - floor planning - placement - physical design flow –global routing - detailed routing - special routing - circuit extraction - DRC.

**TOTAL : 45 PERIODS****REFERENCES**

1. M.J.S .Smith, "Application Specific Integrated Circuits, Addison -Wesley Longman Inc., 1997.
2. Farzad Nekoogar and Faranak Nekoogar, From ASICs to SOCs: A Practical Approach, Prentice Hall PTR, 2003.
3. Wayne Wolf, FPGA-Based System Design, Prentice Hall PTR, 2004.
4. R. Rajsuman, System-on-a-Chip Design and Test. Santa Clara, CA: Artech House Publishers, 2000.
5. F. Nekoogar. Timing Verification of Application-Specific Integrated Circuits (ASICs). Prentice Hall PTR, 1999.

**UNIT I JAVA FUNDAMENTALS 9**

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 NETWORK PROGRAMMING IN JAVA 9**

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.



## 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', 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.

**NE9257**

**MULTIMEDIA COMPRESSION TECHNIQUES**

**L T P C**  
**3 0 0 3**

### **UNIT I INTRODUCTION 9**

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 TEXT COMPRESSION 9**

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

### **UNIT III AUDIO COMPRESSION 9**

Audio compression techniques -  $\mu$ - 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 IMAGE COMPRESSION 9**

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

### **UNIT V VIDEO COMPRESSION 9**

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 – DVI technology – PLV performance – DVI real time compression – Packet Video.

**TOTAL : 45 PERIODS**

## REFERENCES:

1. Khalid Sayood : Introduction to Data Compression, Morgan Kauffman Harcourt India, 2<sup>nd</sup> Edition, 2000.
2. David Salomon : Data Compression – The Complete Reference, Springer Verlag New York Inc., 2<sup>nd</sup> 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, 1<sup>st</sup> 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

**UNIT I WIRELESS LAN, PAN, WAN AND MAN 9**

Characteristics of wireless channel, Fundamentals of WLANs, IEEE 802.11 standard, HIPERLAN Standard, First-, Second-, and third- generation cellular systems, WLL, Wireless ATM, IEEE 802.16 standard, HIPERACCESS, AdHoc Wireless Internet.

**UNIT II MAC, ROUTING AND MULTICAST ROUTING PROTOCOLS 9**

MAC Protocols: Design issues, goals and classification, Contention –based protocols with reservation and scheduling mechanisms, Protocols using directional antennas.

Routing protocols: Design issues and classification, Table-driven, On-demand and Hybrid routing protocols, Routing protocols with efficient flooding mechanisms, Hierarchical and power-aware routing protocols.

Multicast Routing Protocols: Design issues and operation, Architecture reference model, classification, Tree-based and Mesh-based protocols, Energy-efficient multicasting.

**UNIT III TRANSPORT LAYER AND SECURITY PROTOCOLS 9**

Transport layer Protocol: Design issues, goals and classification, TCP over AdHoc wireless Networks, Security, Security requirements, Issues and challenges in security provisioning, Network security attacks, Security routing.

Quality of Service: Issues and challenges in providing QoS, Classification of QoS solutions, MAC layer solutions, Network layer solutions, QoS frameworks.

**UNIT IV ENERGY MANAGEMENT 9**

Need, classification of battery management schemes, Transmission power management schemes, System power management schemes.

Wireless Sensor Networks: Architecture, Data dissemination, Data gathering, MAC protocols, location discovery, Quality of a sensor network.

**UNIT V PERFORMANCE ANALYSIS 9**

ABR beaconing, Performance parameters, Route-discovery time, End-to-end delay performance, Communication throughput performance, Packet loss performance, Route reconfiguration/repair time, TCP/IP based applications.

**TOTAL : 45 PERIODS****REFERENCES**

1. C. Siva Ram Murthy and B.S. Manoj, AdHoc Wireless Networks: Architectures and protocols, Prentice Hall PTR, 2004
2. C.-K.Toh, AdHoc Mobile Wireless Networks: Protocols and Systems, Prentice Hall PTR, 2001
3. Mohammad Ilyas, The Handbook of AdHoc Wireless Networks, CRC press, 2002
4. Charles E. Perkins, AdHoc Networking, Addison – Wesley, 2000
5. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan Stojmenovic, Mobile AdHoc Networking, Wiley – IEEE press, 2004.

**EC9011 SPEECH AND AUDIO SIGNAL PROCESSING**L T P C  
3 0 0 3**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 LINEAR PREDICTIVE ANALYSIS OF SPEECH 10**

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.

**TOTAL : 45 PERIODS**

**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 – 2<sup>nd</sup> edition – Berlin – 1972
5. I.H.Witten – Principles of Computer Speech – Academic Press – 1982

**EC9013**

**SATELLITE COMMUNICATION**

**L T P C  
3 0 0 3**

**UNIT I ORBITAL MECHANICS 9**

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 SPACECRAFT SUB SYSTEMS AND EARTH STATION 9**

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 SPACE LINKS 9**

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 MULTIPLE ACCESS TECHNIQUES AND NETWORK ASPECTS 9**

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 SERVICES AND APPLICATIONS 9**

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 PERIODS**

**REFERENCES**

1. Dennis Roddy, "Satellite Communications", Third 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.Suyderhood, Robert A.Nelson,"Satellite Communication Systems Engineering", 2<sup>nd</sup> Edition, Prentice Hall, New Jersey, 1993
4. Tri T.Ha, "Digital satellite communication", 2<sup>nd</sup> Edition, McGraw Hill, New york.1990

**DI9007 MULTIMEDIA DATABASES L T P C  
3 0 0 3**

**UNIT I INTRODUCTION 9**

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

**UNIT II NORMAL FORM 9**

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 OODB AND ADVANCED DATA STRUCTURES 9**

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

**UNIT IV IMAGE AND TEXT DATABASES 9**

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 VIDEO AND AUDIO DATABASES 9**

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

**TOTAL : 45 PERIODS**



## REFERENCES

1. Elmasri and Navathe, Fundamentals of Database System, 3<sup>rd</sup> 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 Kaufman, 1996.

**DI9008**

**CELLULAR MOBILE COMMUNICATIONS**

**L T P C**  
**3 0 0 3**

### **UNIT I INTRODUCTION TO WIRELESS MOBILE COMMUNICATIONS 9**

History and evolution of mobile radio systems. Types of mobile wireless services / systems - Cellular, WLL, Paging, Satellite systems, Standards, Future trends in personal wireless systems.

### **UNIT II CELLULAR CONCEPT AND SYSTEM DESIGN FUNDAMENTALS 9**

Cellular concept and frequency reuse, Multiple Access Schemes, Channel assignment and handoff, Interference and system capacity, Trunking and Erlang capacity calculations.

### **UNIT III MOBILE RADIO PROPAGATION 9**

Radio wave propagation issues in personal wireless systems, Propagation models, Multipath fading and base band impulse response models, Parameters of mobile multipath channels, Antenna systems in mobile radio.

### **UNIT IV MODULATIONS AND SIGNAL PROCESSING 9**

Analog and digital modulation techniques, Performance of various modulation techniques - Spectral efficiency, Error-rate, Power Amplification, Equalization Rake receiver concepts, Diversity and space-time processing, Speech coding and channel coding.

### **UNIT V SYSTEM EXAMPLES AND DESIGN ISSUES 9**

Multiple Access Techniques – FDMA, TDMA and CDMA systems, Operational systems, Wireless networking, design issues in personal wireless systems.

**TOTAL: 45 PERIODS**

## REFERENCES

1. Feher K., "Wireless digital communications", PHI, New Delhi, 1995.
2. Rappaport T.S., "Wireless Communications; Principles and Practice", Prentice Hall, NJ, 1996.
3. Lee W.C.Y., "Mobile Communications Engineering: Theory and Applications", Second Edition, McGraw-Hill, New York, 1998.
4. Schiller, "Mobile Communications", Pearson Education Asia Ltd., 2000.