

AFFILIATED INSTITUTIONS

ANNA UNIVERSITY, CHENNAI

REGULATIONS - 2009

M.E. DIGITAL COMMUNICATIONS AND NETWORKING

CURRICULUM AND SYLLABI (II-IV SEMESTERS)

SEMESTER – II

Code No.	Course Title	L	T	P	C
Theory					
NE9222	High Speed Networks	3	0	0	3
EC9001	<u>Mobile and Personal Communications</u>	3	0	0	3
CU9254	<u>Digital Communication Receivers</u>	3	0	0	3
EC9005	<u>High Performance Communication Networks</u>	3	0	0	3
E2***	Elective II	3	0	0	3
E3***	Elective III	3	0	0	3
Practical					
DI9321	<u>Digital Communication and Networks Lab II</u>	0	0	4	2
TOTAL		18	0	4	20

SEMESTER – III

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

SEMESTER – IV

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

LIST OF ELECTIVES
M.E. DIGITAL COMMUNICATIONS AND NETWORKING

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

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 COMMUNICATIONSL 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", 4th Edition., McGraw Hill, NewYork, 2001
- 3) E.A. Lee and D.G. Messerschmitt, "Digital Communication", 2nd 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

**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

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., 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.

**AP9252 NEURAL NETWORKS AND APPLICATIONS L T P C
3 0 0 3**

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: 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 RADIAL-BASIS FUNCTION NETWORKS AND SUPPORT VECTOR MACHINES: 9

RADIAL BASIS FUNCTION NETWORKS:

Cover's Theorem on the Separability of Patterns - 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 - ϵ -insensitive Loss Function – Support Vector Machines for Nonlinear Regression

UNIT III COMMITTEE MACHINES: 9

Ensemble Averaging - Boosting – Associative Gaussian Mixture Model – Hierarchical Mixture of Experts Model(HME) – Model Selection using a Standard Decision Tree – A Priori and Postpriori Probabilities – Maximum Likelihood Estimation – Learning Strategies for the HME Model - EM Algorithm – Applications of EM Algorithm to HME Model

NEURODYNAMICS SYSTEMS:

Dynamical Systems – Attractors and Stability – Non-linear Dynamical Systems- Lyapunov Stability – Neurodynamical Systems – The Cohen-Grossberg Theorem.

UNIT IV ATTRACTOR NEURAL NETWORKS: 9

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

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 SELF ORGANISING MAPS: 9

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

PULSED NEURON MODELS:

Spiking Neuron Model – Integrate-and-Fire Neurons – Conductance Based Models – Computing with Spiking Neurons.

TOTAL : 45 PERIODS

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.

UNIT I LAN SWITCHING TECHNOLOGY 9

Switching Concepts, switch forwarding techniques, switch path control, LAN Switching, cut through forwarding, store and forward, virtual LANs.

UNIT II ATM SWITCHING ARCHITECTURE 9

Blocking networks - basic - and- enhanced banyan networks, sorting networks - merge sorting, re-arrangeable networks - full-and- partial connection networks, non blocking networks - Recursive network construction, comparison of non-blocking network, Switching with deflection routing - shuffle switch, tandem banyan switch.

UNIT III QUEUES IN ATM SWITCHES 9

Internal Queueing -Input, output and shared queueing, multiple queueing networks – combined Input, output and shared queueing - performance analysis of Queued switches.

UNIT IV PACKET SWITCHING ARCHITECTURES 9

Architectures of Internet Switches and Routers- Bufferless and buffered Crossbar switches, Multi-stage switching, Optical Packet switching; Switching fabric on a chip; Internally buffered Crossbars.

UNIT V IP SWITCHING 9

Addressing model, 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 Pattavina, "Switching Theory: Architectures and performance in Broadband ATM networks ",John Wiley & Sons Ltd, New York. 1998
2. Elhanany M. Hamdi, "High Performance Packet Switching architectures", Springer Publications, 2007.
3. Christopher Y Metz, "Switching protocols & Architectures", McGraw - Hill Professional Publishing, NewYork.1998.
4. Rainer Handel, Manfred N Huber, Stefan Schroder, "ATM Networks - Concepts Protocols, Applications", 3rd Edition, Addison Wesley, New York. 1999.

UNIT I 9

Data Communication and Network Management Overview: Analogy of Telephone Network Management- Data and Telecommunication Network- Distributed Computing Environments- TCP/IP- Based Networks- Communication Protocols and Standards- Case Histories- Challenges of Information Technology Managers- Network Management: Goals, Organization and Functions- Network and System Management- Network Management System Platform- Current Status and Future of Network

Management- Fundamental of Computer Network Technology: Network Topology, LAN, Network Node components- WAN - Transmission Technology- Integrated Services: ISDN, Frame Relay, and Broadband.

UNIT II **9**

SNMP, Broadband and TMN Management- Basic Foundations: Network Management Standards, Network Management Model- Organization Model- Information Model- Communication model- encoding Structure- Macros- Functional Model- SNMPv1 Network Management: Organization and Information Models- Management Network- The History of SNMP Management- Internet Organizations and Standards- The SNMP Model- The Organization Model- System Overview- The Information Model. SNMPv1 Network Management: Communication Model and Functional Models.

UNIT III **9**

SNMP Management: Major Changes in SNMPv2- SNMPv2 System Architecture- SNMPv2 Structure of Management Information- The SNMPv2 Management Information Base- SNMPv2 Protocol- Compatibility with SNMPv1- SNMPv3- SNMPv3 Documentation- SNMPv3 Documentation Architecture- Architecture- SNMPv3 Applications- SNMPv3 Management Information Base- Security- SNMPv3 User-Based Security Model- Access Control- SNMP Management: RMON- Remote Monitoring- RMON SMI and MIBRMON1- RMON2- ATM Remote Monitoring-Case Study.

UNIT IV **9**

Broadband Networks and services- ATM Technology- ATM Network Management- Broadband Access networks and Technologies-HFC Technology-Data over Cable Reference Architecture-HFC Management-DSL Technologies-ADSL technology-ADSL Management- Telecommunication Management Network-Operation Systems-TMN Conceptual Model- TMN Standard-TMN Architecture-TMN Management Service Architecture-An Integrated view of TMN-Implementation Issues.

UNIT V **9**

Network Management Tools and Systems- Network Statistic Measurement Systems- History of Enterprise Management- Network Management Systems- Commercial Network Management Systems- System Management-Enterprise Management Solutions- Network Management Applications: Configuration management- Fault Management- Performance management- Event correlation Techniques- Security Management- Accounting Management- Report Management- Policy Based Management- Service level Management-Web-Based Management- NMS with Web Interface and Web Based Management- Web Interface to SNMP Management- Embedded Web Based Management- Desktop Management Interface- Web Based Enterprise Management- WBEM: Windows Management Instrumentation- Java Management Extensions-Management of a Storage Area Network.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Mani Subramanian, *Network Management - Principles and Practice*, Addison Wesley, New York, 2000.

REFERENCE:

1. Stephen B. Morris, *Network Management – MIBs and MPLS*, Pearson Education, 2003.

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

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 multivaraiate 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, Montre carlo method and Importance sampling method, estimation of power spectral density of a process

UNIT IV COMMUNICATION NETWORKS 9

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 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,Deiscrete-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", 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

CU9255

INTERNETWORKING MULTIMEDIA

L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Digital sound, video and graphics, basic multimedia networking, multimedia characteristics, evolution of Internet services model, network requirements for

audio/video transform, multimedia coding and compression for text, image, audio and video. Multimedia communication in wireless network.

UNIT II SUBNETWORK 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.

UNIT III MULTICAST AND TRANSPORT PROTOCOL 9

Multicast over shared media network, multicast routing and addressing, scaping multicast and NBMA networks, Reliable transport protocols, TCP adaptation algorithm, RTP, RTCP.

UNIT IV MEDIA - ON – DEMAND 9

Storage and media servers, voice and video over IP, MPEG-2 over ATM/IP, indexing synchronization of requests, recording and remote control.

UNIT V APPLICATIONS 9

MIME, Peer-to-peer computing, shared application, video conferencing, centralized and distributed conference control, distributed virtual reality, light weight session philosophy.

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 McGrawHill, NewDelhi,2000.
4. Ellen kayata wesel, Ellen Khayata, "Wireless Multimedia Communication: Networking Video, Voice and Data", Addison Wesley Longman Publication, USA, 1998.

**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 -3rd 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, 2nd Edition, Que/Sams 2002.

**VL9261 ASIC DESIGN L T P C
3 0 0 3**

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

NE9256	GENETIC ALGORITHMS AND APPLICATIONS	L T P C
		3 0 0 3
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 PERIODS		

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

ET9263

ADHOC NETWORKS

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

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.Toth, 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 – 2nd 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", 2nd Edition, Prentice Hall, New Jersey, 1993
4. Tri T.Ha, "Digital satellite communication", 2nd 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, 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 Kaufman, 1996.

