## AFFILIATED INSTITUTIONS

ANNA UNIVERSITY, CHENNAI

REGULATIONS - 2009

M.E. DIGITAL COMMUNICATIONS AND NETWORKING

CURRICULUM AND SYLLABI (II-IV SEMESTERS)

### SEMESTER – II

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Course Title</th>
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<th>T</th>
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<tr>
<td>NE9222</td>
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### SEMESTER – III

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### SEMESTER – IV

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**TOTAL** 0 0 24 12
LIST OF ELECTIVES
M.E. DIGITAL COMMUNICATIONS AND NETWORKING

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</table>
UNIT I  HIGH SPEED NETWORKS  9

UNIT II  CONGESTION AND TRAFFIC MANAGEMENT  9

UNIT III  TCP AND ATM CONGESTION CONTROL  9

UNIT IV  INTEGRATED AND DIFFERENTIATED SERVICES  9

UNIT V  PROTOCOLS FOR QOS SUPPORT  9

TOTAL : 45 PERIODS

REFERENCES

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

REFERENCES

CU9254  DIGITAL COMMUNICATION RECEIVERS  LTPC  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
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
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
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

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

UNIT I PACKET SWITCHED NETWORKS
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
ISDN - overview, interfaces and functions, Layers and services - Signaling System 7 - Broadband ISDN architecture and Protocols.

UNIT III ATM AND FRAME RELAY
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
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

TOTAL : 45 PERIODS
REFERENCES

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.
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

AP9251 DIGITAL IMAGE PROCESSING L T P C
3 0 0 3
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
UNIT IV  IMAGE SEGMENTATION AND RECOGNITION:  

UNIT V  IMAGE COMPRESSION:  
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:

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

UNIT I  BASIC LEARNING ALGORITHMS:  

UNIT II  RADIAL-BASIS FUNCTION NETWORKS AND SUPPORT VECTOR MACHINES:  
RADIAL BASIS FUNCTION NETWORKS:

SUPPORT VECTOR MACHINES:  
UNIT III  COMMITTEE MACHINES:  9

NEURODYNAMICS SYSTEMS:

UNIT IV  ATTRACTOR NEURAL NETWORKS:  9
Associative Learning – Attractor Neural Network Associate Memory – Linear Associate Memory – Hopfield Network – Content Addressable Memory – Strange Attractors and Chaos – Error Performance of Hopfield Networks – Applications of Hopfield Networks – Simulated Annealing – Boltzmann Machine – Bidirectional Associate Memory – BAM Stability Analysis – Error Correction in BAMs – Memory Annihilation of Structured Maps in BAMS – Continuous BAMs – Adaptive BAMs – Applications

ADAPTIVE RESONANCE THEORY:

UNIT V  SELF ORGANISING MAPS:  9

PULSED NEURON MODELS:

TOTAL : 45 PERIODS

REFERENCES:
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

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

UNIT I  NETWORK MANAGEMENT 9

UNIT II

UNIT III

UNIT IV

UNIT V

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCE:
UNIT I  CIRCUIT SWITCHING NETWORKS  9

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

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
4. Behrouz A Forouzan, "Data Communications and Networking (3/e), TMH, 2004

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 bursty 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 multivariatate 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
UNIT I SYMMETRIC CIPHERS (Techniques and Standards) – I
Introduction – Services, Mechanisms and Attacks, OSI security Architecture, Model for
network Security; Classical Encryption Techniques- Symmetric Cipher Model,
Substitution Techniques, Transposition Techniques, Rotor Machines, Stegnography;
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
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
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
Authentication Applications- Kerberos, X.509 Authentication Service; Electronic Mail
Architecture, Authentication Header, Encapsulating Security Payload, Combining
Security Associations; Web Security- Web Security Considerations, Secure Sockets

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

REFERENCES
India, New Delhi ,2004
New Delhi, 2004
Edition. Prentice Hall of India, New Delhi, 2004
audio/video transform, multimedia coding and compression for text, image, audio and video. Multimedia communication in wireless network.

UNIT II SUBNETWORK TECHNOLOGY
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
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
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
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:

DI9005 INTERNET PROGRAMMING L T P C
3 0 0 3

UNIT I INTRODUCTION

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

UNIT III JAVASCRIPT
JavaScript, Introduction to Scripting, Control Statements, Functions, Arrays, Objects.

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

UNIT V  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

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

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

DI9006 ADVANCED JAVA TECHNOLOGY  L T P C
3 0 0 3

UNIT I JAVA FUNDAMENTALS 9

UNIT II NETWORK PROGRAMMING IN JAVA 9

UNIT III DISTRIBUTED COMPUTING IN JAVA 9

UNIT IV MULTI – TIER APPLICATION DEVELOPMENT 9

UNIT V MOBILE APPLICATION DEVELOPMENT 9

TOTAL : 45 PERIODS

REFERENCES
UNIT I

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

UNIT III
Genetic Algorithm in engineering and optimization - natural evolution - simulated annealing and Tabu search. Genetic Algorithm in scientific models and theoretical foundations.

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

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

TOTAL : 45 PERIODS

REFERENCES
UNIT IV IMAGE COMPRESSION

UNIT V VIDEO COMPRESSION

TOTAL : 45 PERIODS

REFERENCES:

ET9263 ADHOC NETWORKS L T P C 3 0 0 3

UNIT I WIRELESS LAN, PAN, WAN AND MAN

UNIT II MAC, ROUTING AND MULTICAST ROUTING PROTOCOLS

UNIT III TRANSPORT LAYER AND SECURITY PROTOCOLS
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, Date gathering, MAC protocols, location discovery, Quality of a sensor network.

UNIT V  PERFORMANCE ANALYSIS  9
ABR beaoning, Performance parameters, Route-discovery time, End-to-end delay performance, Communication throughput performance, Packet loss performance, Route reconfiguration/repair time, TCP/IP based applications.

REFERENCES
1. C. Siva Ram Murthy and B.S. Manoj, AdHoc Wireless Networks: Architectures and protocols, Prentice Hall PTR, 2004

TOTAL : 45 PERIODS

EC9011  SPEECH AND AUDIO SIGNAL PROCESSING  L  T  P  C
3  0  0  3

UNIT I  8

UNIT II  TIME DOMAIN METHODS FOR SPEECH PROCESSING  8

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:

UNIT IV  LINEAR PREDICTIVE ANALYSIS OF SPEECH  10
UNIT V  APPLICATION OF SPEECH & AUDIO SIGNAL PROCESSING  10

REFERENCES

TOTAL : 45 PERIODS

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

DI9007 MULTIMEDIA DATABASES

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

UNIT V VIDEO AND AUDIO DATABASES 9

TOTAL : 45 PERIODS

REFERENCES
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.

REFERENCES