# M.E. Computer Networks

## Semester II

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
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## Semester IV

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Total no. of credits to earn for the award of Degree 21+20+15+12 = 68
## LIST OF ELECTIVES
### M.E. COMPUTER NETWORKS

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UNIT I  CONVENTIONAL ENCRYPTION  9
Introduction, Conventional encryption model, Stegnography , Data Encryption Standard, block cipher, Encryption algorithms, confidentiality, Key distribution

UNIT II  PUBLIC KEY ENCRYPTION AND HASHING  9
Principles of public key cryptosystems, RSA algorithm, Diffie-Hellman Key Exchange, Elliptic curve cryptology, message authentication and Hash functions, Hash and Mac algorithms, Digital signatures

UNIT III  IP SECURITY  9
IP Security Overview, IP security Architecture, authentication Header, Security payload, security associations, Key Management

UNIT IV  WEB SECURITY  9
Web security requirement, secure sockets layer, transport layer security, secure electronic transaction, dual signature

UNIT V  SYSTEM SECURITY  9
Intruders, Viruses, Worms, firewall design, Trusted systems, antivirus techniques, digital Immune systems

TOTAL: 45 PERIODS

REFERENCES:

UNIT I  HIGH SPEED NETWORKS  9

UNIT II  CONGESTION AND TRAFFIC MANAGEMENT  9
UNIT III  TCP AND ATM CONGESTION CONTROL  

UNIT IV  INTEGRATED AND DIFFERENTIATED SERVICES  
Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ – Random Early Detection, Differentiated Services

UNIT V  PROTOCOLS FOR QOS SUPPORT  

TOTAL : 45 PERIODS

REFERENCES

NE9223  GRAPH THEORY  
L T P C  3 0 0 3

UNIT I  INTRODUCTION  

UNIT II  MATCHING CONNECTIVITY AND FLOW  

UNIT III  COLOURING  
Vertex Colourings and Upper Bounds - Structure of k-chromatic Graphs, Enumerative Aspects.
UNIT IV PLANAR GRAPHS, EDGES AND CYCLES 9

UNIT V RAMSEY THEORY AND RANDOM GRAPHS 9

REFERENCES:
5. Wilson “Introduction to Graph Theory”, 2nd edition, Pearson Education India

CP9222 WIRELESS NETWORKS L T P C
3 0 0 3

UNIT I WIRELESS LOCAL AREA NETWORKS 9
Introduction to wireless LANs - IEEE 802.11 WLANs - Physical Layer- MAC sublayer - MAC Management Sublayer- Wireless ATM - HIPERLAN- HIPERLAN-2, WiMax

UNIT II 3G OVERVIEW & 2.5G EVOLUTION 9
Migration path to UMTS, UMTS Basics, Air Interface, 3GPP Network Architecture, CDMA2000 overview- Radio and Network components, Network structure, Radio network, TD-CDMA, TD-SCDMA.

UNIT III ADHOC & SENSOR NETWORKS 9
Characteristics of MANETs, Table-driven and Source-initiated On Demand routing protocols, Hybrid protocols, Wireless Sensor networks- Classification, MAC and Routing protocols.

UNIT IV INTERWORKING BETWEEN WLANS AND 3G WWANS 9
Interworking objectives and requirements, Schemes to connect WLANs and 3G Networks, Session Mobility, Interworking Architectures for WLAN and GPRS, System Description, Local Multipoint Distribution Service, Multichannel Multipoint Distribution system.

UNIT V 4G & BEYOND 9
4G features and challenges, Technology path, IMS Architecture, Convergent Devices, 4G technologies, Advanced Broadband Wireless Access and Services, Multimedia, MVNO.

TOTAL: 45 PERIODS
REFERENCES:

NE9227 WIRELESS NETWORK LAB L T P C
0 0 4 2
I. Using CDMA Spread Spectrum Trainer
1) Embedded wireless solutions using CDMA network
2) GPS integrated GSM modules using SMS for in tracking & remote monitoring applications

II. Using GPS Trainer
3) Embedded GPS modules interfaced with other embedded modules for location based applications
4) GPS integrated GSM modules using SMS for in tracking & remote monitoring applications

III. Using GSM Trainer
5) Developing GSM board+ SIM card based applications emulating mobile phones (Eg. Mobile ATM Vans)
6) SMS based remote monitoring/control applications using existing GSM network

IV. Using Bluetooth Trainer
7) Bluetooth based wireless personal area networking (WPAN) – printers, mouse, keypads, and mobiles
8) Combining RFID and Bluetooth

V. Mobile Communication Trainer MT2000
9) Can be used as stand alone or full product development kit in 49 MHz ISM band

VI. RFID Development Kit
10) Tag all assets inside Embedded Wireless Lab with RFID
11) Use of passive and active tags for Library Management system
VII. Smart Wireless Applications & Wireless Sensor Networks
12) Remote door locks and gate openers

Requirement for a batch of 25 students
1. CDMA Trainer 2 Nos
2. GPS Trainer 2 Nos
3. GSM Trainer 2 Nos
5. RFID Trainer 2 Nos
6. MT2000 2 Nos
7. Ptolemy (free software) 2 Nos

TOTAL : 60 PERIODS

CS9251 MOBILE COMPUTING L T P C
UNIT I WIRELESS COMMUNICATION FUNDAMENTALS 9
Introduction – Wireless transmission – Frequencies for radio transmission – Signals –

UNIT II TELECOMMUNICATION SYSTEMS 11
GSM – System Architecture – Protocols – Connection Establishment – Frequency

UNIT III WIRELESS NETWORKS 9
Wireless LAN – IEEE 802.11 Standards – Architecture – Services – HIPERLAN – Adhoc
Network – Blue Tooth.

UNIT IV NETWORK LAYER 9
ZRP – ODMR.

UNIT V TRANSPORT AND APPLICATION LAYERS 7
TCP over Wireless Networks – Indirect TCP – Snooping TCP – Mobile TCP – Fast
Retransmit / Fast Recovery – Transmission/Timeout Freezing – Selective Retransmission
WML – WML Script – WAE – WTA.

TOTAL : 45 PERIODS

REFERENCES:
2. William Stallings, “Wireless Communications and Networks”, Pearson Education,
   2002.
4. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of
UNIT I NETWORKING AND NETWORK ROUTING: AN INTRODUCTION 9

UNIT II ROUTING ALGORITHMS: 9

UNIT III ROUTING PROTOCOLS: FRAMEWORK AND PRINCIPLES 9

UNIT IV INTERNET ROUTING AND ROUTER ARCHITECTURES 9

UNIT V ANALYSIS OF NETWORK ALGORITHMS 9
Network Bottleneck, Network Algorithmics, Strawman solutions, Thinking Algorithmically, Refining the Algorithm, Cleaning up, Characteristics of Network Algorithms.
IP Packet Filtering and Classification : Classification, Classification Algorithms, Naïve Solutions, Two-Dimensional Solutions, Approaches for d Dimensions.

TOTAL : 45 PERIODS

REFERENCES:
4. TCP/IP Volume 1,2,3 (N. Richard Steveus Addison Wesley)
UNIT I BASIC LEARNING ALGORITHMS

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

UNIT III COMMITTEE MACHINES:

NEURODYNAMICS SYSTEMS:

UNIT IV ATTRACTOR NEURAL NETWORKS:

ADAPTIVE RESONANCE THEORY:

UNIT V SELF ORGANISING MAPS:

PULSED NEURON MODELS:

TOTAL: 45 PERIODS

REFERENCES:
5. B. Yegnanarayana, “Artificial Neural Networks” Prentice Hall of India, 1999

CR9003 SOFTWARE QUALITY ASSURANCE L T P C
3 0 0 3

UNIT I

UNIT II
Basics of software testing – test generation from requirements – finite state models – combinatorial designs – test selection, minimization and prioritization for regression testing – test adequacy, assessment and enhancement

UNIT III

UNIT IV

UNIT V
Project progress control – costs – quality management standards – project process standards – management and its role in SQA –SQA unit

TOTAL :45 PERIODS

REFERENCES:
CS9225

WEB TECHNOLOGY

UNIT I

UNIT II
Client side programming – Java script language – java script objects – host objects :Browsers and the DOM

UNIT III

UNIT IV

UNIT V

REFERENCES:

CP9253

HIGH SPEED SWITCHING ARCHITECTURE

UNIT I
LAN SWITCHING TECHNOLOGY
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:
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:
Basic link analysis, Interference analysis, Rain induced attenuation and interference, Ionospheric characteristics, Link Design with and without frequency reuse.

**UNIT IV SATELLITE NAVIGATION AND GLOBAL POSITIONING SYSTEM**

Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Receiver Operation and Differential GPS

**UNIT V APPLICATIONS**


**REFERENCES:**

**CS9265 PERFORMANCE EVALUATION OF COMPUTER SYSTEMS AND NETWORKS**

**UNIT I**


**UNIT II**


**UNIT III**

Markovian FIFO Queuing Systems – M/M/1 – M/M/a – M/M/∞ - M/G/1 – M/M/m/m and other Markov – Non – Markovian and self – similar models – Network of Queues – Burke’s Theorem – Jackson’s Theorem.

**UNIT IV**


**UNIT V**

TEXT BOOKS

REFERENCES

NE9258 ADVANCED ALGORITHMS L T P C
3 0 0 3

UNIT I INTRODUCTION 9
Mathematical Background - Design and Analysis of algorithms – Time and Space Complexity - Basic concepts

UNIT II SORTING AND ORDER STATISTICS 9

UNIT III DESIGN TECHNIQUES 9

UNIT IV GRAPH AND PARALLEL ALGORITHMS 9
Graphs - Representation - Traversals - Topological sort - Minimum spanning tree - Shortest paths – Bi connected and strongly connected components - Parallel algorithms - Sorting - Matrix multiplication - Numerical - Graph.

UNIT V SELECTED TOPICS 9
NP Completeness - Approximation algorithms - Matrices - Transitive closure - Warshall’s - Kronrod’s algorithm - Computational Geometry

TOTAL : 45 PERIODS

TEXT BOOK:
REFERENCES:

NE9259          TELECOMMUNICATION AND SWITCHING TECHNIQUES         L T P C
                              3  0 0 3

UNIT I          EVOLUTION OF TELECOMMUNICATION SWITCHING AND CIRCUIT   9
Evolution of Public Switched Telecommunication Networks Strowger exchange, Crossbar exchange, Stored programme exchange Digital exchange – Basic Tele communication equipments – Telephone handset, Hybrid circuit, Echo suppressors and cancellers, PCM coders, Modems and Relays.

UNIT II          ELECTRONIC SWITCHING                               9
Circuit Switching, Message switching, Centralized stored programme switching, Time switching, Spare switching, Combination switching – Digital switching system hardware configuration, Switching system software, Organization, Switching system call processing software, Hardware software integration.

UNIT III          TELECOMMUNICATION SIGNALLING AND TRAFFIC        9
Channel associated signaling, Common channel signaling, SS7 signaling protocol, SS7 protocol architecture, Concept of Telecommunication traffic, Grade of service, Modeling switching systems, Blocking models and Delay systems.

UNIT IV          INTEGRATED DIGITAL NETWORKS                     9
Subscriber loop characteristics, Local access wire line and wire less PCM / TDM carrier standards transmission line codes, Digital multiplexing techniques, Synchronous, Asynchronous, Plesiocronous multiplexing techniques, SONET / SDH, Integrated Digital Network (IDN) environment – Principles of Integrated Services Digital Network (ISDN) – Cellular Mobile Communication Principles.

UNIT V          DATA NET WORKS                                   9

TOTAL :45 PERIODS

TEXT BOOKS:

REFERENCES:

NE9260 STORAG E AREA NETWORKS LT P C 3 0 0 3

UNIT I

UNIT II

UNIT III

UNIT IV

UNIT V

TOTAL: 45 PERIODS

TEXT BOOKS:
REFERENCES:

NE9261 ENTERPRISE NETWORKS

UNIT I INTRODUCTION TO NETWORK CONCEPTS, STANDARDS AND PROTOCOLS

UNIT II LOCAL AND WIDE AREA NETWORK TOPOLOGIES AND HARDWARE
Physical and Logical Topologies - Network Switching - Ethernet Local Area Networks - Networking Hardware - Wide Area Networking Technologies -WAN Topologies – WANS and WAN Transmission Methods - WAN Implementation and Remote Connectivity

UNIT III ENTERPRISE NETWORKING WITH WINDOWS 2000 AND NETWARE
Network Operating Systems - Networking with Windows 2000 – Enterprise Networking with NetWare - NetWare Based Networking

UNIT IV ENTERPRISE NETWORKING WITH UNIX
Networking with UNIX – Internetworking with TCP/IP for Enterprise Applications - Networking with TCP/IP: Internet, Intranet and Extranet - Internet Applications for Enterprise

UNIT V ENTERPRISE NETWORK MANAGEMENT

TOTAL: 45 PERIODS

TEXTBOOK:
REFERENCES

NE9262 OPTICAL COMMUNICATION SYSTEMS AND NETWORKING  L T P C
3 0 0 3

UNIT I   INTRODUCTION AND TECHNOLOGY  9

UNIT II   MODULATION, DEMODULATION AND TRANSMISSION OF OPTICAL SIGNAL  9
Modulation - Demodulation - transmission system engineering -Optical amplifiers - crosstalk - dispersion - fiber non linearities - wavelength stabilization - overall design considerations.

UNIT III   NETWORKS  9

UNIT IV   CONTROL AND MANAGEMENT  9

UNIT V   ACCESS NETWORKS & SWITCHING  9
Network architecture overview - today’s access networks - future Access networks - optical access network architecture - application area - OTDM - mux and demuxing - synchronization - broadcast OTDM networks - switch bared networks - OTDM Test beds

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCE:
UNIT I  INTRODUCTION

UNIT II  PROCESSES AND DISTRIBUTED OBJECTS
Interprocess Communication - The API for the Internet Protocols - External Data Representation and Marshalling - Client-Server Communication - Group Communication - Case Study - Distributed Objects and Remote Invocation - Communication Between Distributed Objects - Remote Procedure Call - Events and Notifications - Java RMI - Case Study.

UNIT III  OPERATING SYSTEM ISSUES – I

UNIT IV  OPERATING SYSTEM ISSUES – II
Name Services -Domain Name System - Directory and Discovery Services – Global Name Service - X.500 Directory Service - Clocks, Events and Process States - Synchronizing Physical Clocks - Logical Time And Logical Clocks - Global States - Distributed Debugging - Distributed Mutual Exclusion – Elections – Multicast Communication Related Problems.

UNIT V  DISTRIBUTED TRANSACTION PROCESSING
Transactions - Nested Transactions - Locks - Optimistic Concurrency Control - Timestamp Ordering - Comparison - Flat and Nested Distributed Transactions – Atomic Commit Protocols - Concurrency Control in Distributed Transactions – Distributed Deadlocks - Transaction Recovery - Overview of Replication And Distributed Multimedia Systems

TOTAL : 45 PERIODS

TEXT BOOK:

REFERENCES:
UNIT I  INTRODUCTION AND QOS  

UNIT II  OPERATING SYSTEMS  
Real-Time Processing-Scheduling - Interprocess Communication-Memory and management-Server Architecture-Disk Management.

UNIT III  FILE SYSTEMS AND NETWORKS  
Traditional and Multimedia File Systems-Caching Policy-Batching-Piggy backing-Ethernet-Gigabit Ethernet-Token Ring-100VG AnyLAN-Fiber Distributed Data Interface(FDDI)- ATM Networks-MAN-WAN.

UNIT IV  COMMUNICATION  

UNIT V  SYNCHRONIZATION  
Synchronization in Multimedia Systems-Presentation-Synchronization Types-Multimedia Synchronization Methods-Case Studies-MHEG-MODE-ACME.

TOTAL : 45 PERIODS

TEXT BOOK:

REFERENCES:
5. Ze-Nian Li and Mark S. Drew, Fundamentals of Multimedia, Pearson,

UNIT II KNOWLEDGE REPRESENTATION AND REASONING 9
Logical Agents-First order logic-First Order Inference-Unification-Chaining- Resolution Strategies-Knowledge Representation-Objects-Actions-Events

UNIT III PLANNING AGENTS 9

UNIT IV AGENTS AND UNCERTAINTY 9
Acting under uncertainty – Probability Notation-Bayes Rule and use – Bayesian Networks- Other Approaches-Time and Uncertainty-Temporal Models- Utility Theory - Decision Network – Complex Decisions

UNIT V HIGHER LEVEL AGENTS 9
Knowledge in Learning-Relevance Information-Statistical Learning Methods-Reinforcement Learning-Communication-Formal Grammar-Augmented Grammars- Future of AI

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCES:

NE9266 SIMULATION OF COMMUNICATION SYSTEMS AND 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 ARMA Sequences, Sampling rate for simulation, Computer generation and testing of random numbers
UNIT III ESTIMATION OF PERFORMANCE MEASURES
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
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
Queues in tandem, store and forward communication networks, capacity allocation, Congestion and flow chart, Routing model, Network layout and Reliability

TEXT BOOK:

REFERENCES:

TOTAL :45PERIODS

CR9005 INFRASTRUCTURE MANAGEMENT L T P C
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UNIT I INFRASTRUCTURE MANAGEMENT OVERVIEW
Definitions, Infrastructure management activities, Evolutions of Systems since 1960s (Mainframes-to-Midrange-to-PCs-to-Client-server computing-to-New age systems) and their management, growth of internet, current business demands and IT systems issues, complexity of today’s computing environment, Total cost of complexity issues, Value of Systems management for business

UNIT II PREPARING FOR INFRASTRUCTURE MANAGEMENT
Factors to consider in designing IT organizations and IT infrastructure, Determining customer’s Requirements, Identifying System Components to manage, Exist Processes, Data, applications, Tools and their integration, Patterns for IT systems management, Introduction to the design process for information systems, Models, Information Technology Infrastructure Library (ITIL)

UNIT III SERVICE DELIVERY PROCESSES
Service-level management, financial management and costing, IT services continuity management, Capacity management, Availability management

UNIT IV SERVICE SUPPORT PROCESSES
Configuration Management, Service desk, Incident management, Problem management, Change management, Release management

**UNIT V STORAGE AND SECURITY MANAGEMENT**
Introduction Security, Identity management, Single sign-on, Access Management, Basics of network security, LDAP fundamentals, Intrusion detection, firewall, security information management Introduction to Storage, Backup & Restore, Archive & Retrieve, Space Management, SAN & NAS, Disaster Recovery, Hierarchical space management, Database Application protection, Bare machine recovery, Data retention

TOTAL : 45 PERIODS

**REFERENCES:**