University of Pune
Structure M.E. Computer(Computer Networks) to be implemented from July-2008

Term-I

Subject Code	Subject Title	Teaching Scheme		Examination Scheme				
		Lect.	Pract.	Paper	TW	Oral	Total	Credits
510301	Applied Algorithms	03	--	100	--	--	100	3
510302	Emerging trends in Computer Architecture	03	--	100	--	--	100	3
510303	Principles and Practices for IT Management	03		100			100	3
510304	Elective-I	03	--	100	--	--	100	3
510305	Elective-II	03	--	100	--	--	100	3
510306	Laboratory Practice-I	--	06		50		50	3
510307	Seminar-I		04		50		50	2
	Total	**15**	**10**	**500**	**100**		**600**	**20**

Term-II

Subject Code	Subject Title	Teaching Scheme		Examination Scheme				
		Lect.	Pract.	Paper	TW	Oral	Marks	Credits
510308	Operating System Design	03	--	100	--	--	100	3
510309	High Performance Database Systems	03	--	100	--	--	100	3
510310	Advanced Software Engineering	03	--	100	--	--	100	3
510311	Elective-III	03	--	100	--	--	100	3
510312	Elective-IV	03	--	100	--	--	100	3
510313	Laboratory Practice-II	--	06		50		50	3
510314	Seminar-II	--	04	--	50	--	50	2
	Total	**15**	**10**	**500**	**100**		**600**	**20**

Term-III

Subject Code	Subject Title	Teaching Scheme		Examination Scheme				
		Lect.	Pract.	Paper	TW	Oral	Total	Credits
510315	Seminar-III	--	04	--	50	--	50	2
510316	Project stage-I	--	18	--	50	--	50	6
	Total	**--**	**22**	**--**	**100**		**100**	**8**

Term-IV

Subject Code	Subject Title	Teaching Scheme		Examination Scheme				
		Lect.	Pract.	Paper	TW	Oral	Marks	Credits
510316	Project stage-II*	--	18	--	150	50	200	12
	Total	**--**	**18**	**--**	**150**		**200**	**12**

* : The term work of project stage II of semester IV should be assessed jointly by the pair of internal and external examiner along with the oral examination of the same

Subject Code	**Elective-I**	Subject Code	**Elective-II**
510304 A	Internet Routing Design	510305 A	Wireless Technolgy
510304 B	Advanced TCP/IP	510305 B	Information Security Audit and Management

Subject Code	**Elective-III**	Subject Code	**Elective-IV**
510311 A	Network Programming	510312 A	Infrastructure Management
510311 B	Network Design, Modeling and Analysis	510312 B	Convergence Technology
		510312 C	Open Elective(Self Study)**

**:- Open elective subject –BOS computer engineering will declare the list of subjects which can be taken under open elective.

51510301 Applied Algorithms

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hrs/week	Theory: 100 Marks
	Total Credits : 03

1. Introduction to Probability and Problem Solving:

Summation Formulas and properties, Bounding Summations, **Counting and Probability**: Probability Axioms, Discrete and continuous Probability Distribution, Conditional Probability, Baye's Theorem, Discrete Random Variables, Expected Value of Random Variable, Variance and standard deviation, Geometric and Binomial distribution, **Proof Techniques** contradiction, mathematical induction, strong induction, recursive mathematical definitions.

2. Analysis of Algorithms

Review of algorithmic strategies, **Asymptotic analysis**: upper and lower complexity bounds. Identifying differences among best, average and worst Case Behaviors. Big O, little O, omega and theta notations, Standard complexity classes. Empirical measurements of performance. Time and space tradeoffs in algorithms. Analyzing recursive algorithms using recurrence relations.

3. Fundamental Computing Algorithms

Numerical algorithms, Sequential and binary search algorithms. Quadratic sorting algorithms and O (n log n) sorting algorithms. Algorithms on graphs and their complexities.

4. Approximation Algorithms

Introduction, Absolute approximation, Epsilon approximation, Polynomial time approximation schemes, Probabilistically good algorithms.

5. Advanced Algorithmic Analysis

Amortized analysis, online and offline algorithms, randomized algorithms. Dynamic programming: matrix chain multiplication and longest common subsequence, Greedy algorithms: action-selection problem and Huffman codes, combinatorial optimization.

6. Parallel Algorithms

PRAM Model: Parallel computers and models, performance measures. Parallel Complexity: The NC Class, Basic Lower and Upper Bounds. Algorithms for Parallel Computers: Pointer Doubling, CRCW algorithms and EREW algorithms. Brent's Theorem and Work Efficiency.

Reference Books:

1. Kishore S. Trivedi, "Probability & Statistics with Reliability, Queing, and Computer Science Applications" PHI
2. Cormen, Leiserson, Rivest, "Algorithms", PHI
3. Bressard, "Fundamentals of Algorithms", PHI
4. Horowitz, Sahni, "Fundamentals of Computer Algorithm", Galgotia
5. Lakshmivarahan S., Dhall S., "Analysis and Design of Parallel Algorithms", McGrawHill
6. S. Baase, S and A. Van Gelder, "Computer Algorithms: Introduction to Design and Analysis", 3rd edition. Addison Wesley, 2000
7. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms", Addison Wesley
8. Knuth, "Art of Programming", Addison Wesley
9. C Papadimitriou and K Steiglitz, "Combinatorial Optimization", PHI

510302 Emerging trends in Computer Architecture

Teaching Scheme:
Lectures:4 Hrs/Week

Exam Scheme:
Theory Paper : 100 Marks
Total Credits : 03

1. Advanced Computer System architecture

EPIC Concepts, Multi core Architecture, **Case Study :** Intel Itanium Processor, multiprocessors ,Symmetric & CC-NUMA multiprocessors, SMP Servers-File Servers/ Graphics Servers/Internet Servers. Cluster Computing : Clustering- challenges, support for clustering, COW s, support for single system image Communication substrate, MPI/PVM ,HPCC suites, Cluster Monitoring and Management Tools. Cluster of servers, .Blade Servers

Case studies**:** IBM cluster, Beowulf cluster-caltech , Digital true Unix cluster(springerlink.com/content) , next generation clusters- infiniband.

MPP - Technology , new generation of MPPs , Distributed memory MPPs -, Achieving high performance on NOW

2. System Interconnects:

Basics revised, Gigabit network technologies – Giga Bit Ethernet, Myrient (Myricom), Quadrinet(Quadrics), PARAM net (CDAC), ATM switches & networks – ATM architecture, inter network connectivity

3. Threading, synchronization and communication

Multithreaded Architecture, approaches to multi threading, Software multithreading, Synchronization mechanisms, TCP/IP protocol suite, fast & efficient communication- Log P Communication model, communication algorithms, Case Study: IBM Power IV, V

4. Storage

Storage Area Network (SAN), Network attached storage and direct storage. Storage area network versus system area network, Computer Architecture Research Challenges: How Computer Architecture Trends may Affect Future Distributed Systems

5. Grid Computing

Grid fundamentals – Cluster to grid computing , Grid computing models- ARC model, ARCC model, Sneha-Samuham computing model, Grid architecture considerations, Standards for grid -OGSA , OGSI ,OGSA-DAI, Grid FTP, WSRF, Web services related standards, Grid architecture models, Computational grid , Data grid , Grid topologies, Basic methodology

6. Parallel programming:

Paradigms, parallel programming models, shared memory programming , message passing programming – paradigms , MPI , PVM ,Threads, Data parallel programming – model, Case study – High performance FORTRAN, CCC, HP Java, Other data parallel approaches

Reference Books

1. Kai Hwang, Zhiwei Xu -"Scalable Parallel Computers"
2. Data Manual of respective processors.
3. Introduction to grid computing - Bart Jacob , Michael Brown
4. Grid Computing – A research Monograph - D. Janakiram (TMGH)
5. Parallel Programming
6. Storage Networks – Wulfgong Muller (Wiley)

510303 Principles and Practices for IT Management

Teaching Scheme
Lectures: 3 Hrs/week

Examination Scheme
Theory: 100 Marks
Total Credits : 03

1. Management Perspectives

Role and importance of management, process of management – planning, organizing, staffing, directing, controlling. Nature, purpose and principles of management, Business policy, tools and techniques of strategic management, business ethics and social responsibilities

2. Preliminary planning of an IT Project

Gathering project Information, defining the project goals, establishing project priorities, requirements analysis, risk management, budgeting a project, creating a work breakdown structure, estimation

3. Organizing an IT Project

Organizing a Project Team: - Assessing internal scales, creating a team, managing team issues, resources procurement

Preparing and Implementing the project plan: - Defining the project schedule, project network diagram creation and analysis, project constraints, tracking project progress and financial obligations

Revising the project plan:-need for revision , establishing change control, implementing the project changes, coping with project delays

4. Group Dynamics and Team Management

Theories of Group Formation –Formal and Informal Groups and their interaction, Importance of teams - Formation of teams – Team Work, Leading the team, Team Meeting. Conflict Management - Traditional vis-à-vis Modern view of conflict, Conflict Process - Strategies for resolving destructive conflict, Stress management, employee welfare, energy management and energy audit,

5. Modern approaches to management

Concept of Knowledge management**,** change management, technology management, supply chain management, introduction to Intellectual property Rights (IPR)and cyber laws, process and project quality standards – six sigma, CMM, CMMI, PCMM, Impact of IT quality management systems, learning organizations

6. Applications of IT in management

Application of IT in functions like finance and accounting, stores, purchase, product design and development, quality control, logistics, customer relationship, marketing, project management, health care, insurance, banking, agriculture and service sector.

Reference Books:

1. Joseph Phillips, “IT Project Management”, Tata McGraw-Hill 2003 Edition
2. Management-Tasks, Responsibilities and practices, Peter Drucker
3. Management Theory and Practice- Ernst Dale
4. Management Information System-Javadekar
5. Business Policy- Azhar Kazmi
6. Industrial Energy Conservation- D.A.Ray, Pergamon Press

7. Resisting Intellectual Property-Halbert, Taylor & Francis Ltd ,2007

ELECTIVE-I
510304A Internet Routing Design

Teaching Scheme
Lectures: 3 Hrs/week

Examination Scheme
Theory: 100 Marks
Total Credits : 03

1 Networking and Network Routing: An Introduction

Addressing and Internet Service: An Overview, Network Routing, IP Addressing, Service Architecture, Protocol Stack Architecture, Router Architecture, Network Topology, Architecture, Network Management Architecture, Public Switched Telephone Network

2 Routing Algorithms:

Shortest Path and Widest Path**:** Bellman–Ford Algorithm and the Distance Vector Approach, Dijkstra's Algorithm, Widest Path Algorithm, Dijkstra-Based Approach, Bellman–Ford-Based Approach, *k*-Shortest Paths Algorithm.
OSPF and Integrated IS-IS **:** OSPF: Protocol Features, OSPF Packet Format, Integrated IS-IS, Key Features, comparison
BGP **:** Features ,Operations, Configuration Initialization, phases, Message Format.
IP Routing and Distance Vector Protocol Family **:**RIPv1 and RIPv2

3 Routing Protocols: Framework and Principles

Routing Protocol, Routing Algorithm, and Routing Table, Routing Information Representation and Protocol Messages, Distance Vector Routing Protocol, Link State Routing Protocol, Path Vector Routing, Protocol, Link Cost.

4. Internet Routing and Router Architectures

Architectural View of the Internet, Allocation of IP Prefixes and AS Number, Policy-Based Routing, Point of Presence, Traffic Engineering Implications, Internet Routing Instability.
Router Architectures**:** Functions, Types, Elements of a Router, Packet Flow, Packet Processing: Fast Path versus Slow Path, Router Architectures

5. Analysis of Network Algorithms

Network Bottleneck, Network Algorithmics, Strawman solutions, Thinking Algorithmically, Refining the Algorithm, Cleaning up, Characteristics of Network Algorithms.
IP Address Lookup Algorithms : Impact, Address Aggregation, Longest Prefix Matching, Naïve Algorithms, Binary , Multibit and Compressing Multibit Tries, Search by Length Algorithms, Search by Value Approaches, Hardware Algorithms, Comparing Different Approaches
IP Packet Filtering and Classification : Classification, Classification Algorithms, Naïve Solutions, Two-Dimensional Solutions, Approaches for *d* Dimensions,

6. Quality of Service Routing

QoS Attributes, Adapting Routing: A Basic Framework. Update Frequency, Information Inaccuracy, and Impact on Routing, Dynamic Call Routing in the PSTN, Heterogeneous Service, Single-Link Case, A General Framework for Source-Based QoS Routing with Path Caching , Routing Protocols for QoS Routing, QOSPF: Extension to OSPF for QoS Routing, ATM PNNI.

7. Routing and Traffic Engineering

Traffic Engineering of IP/MPLS Networks, VPN Traffic Engineering, Problem Illustration: Layer 3 VPN, LSP Path Determination: Constrained Shortest Path Approach, LSP Path Determination: Network Flow Modeling Approach, Layer 2 VPN Traffic Engineering, Observations and General Modeling Framework, Routing/Traffic Engineering for Voice Over MPLS.

REFERENCES:

1. Network Routing: Algorithms, Protocols, and Architectures Deepankar Medhi and Karthikeyan Ramasamy (Morgan Kaufmann Series in Networking)
2. Network Algorithmics: An Interdisciplinary Approach to Designing Fast Networked Devices George Varghese (Morgan Kaufmann Series in Networking)

ELECTIVE-I

510304B ADVANCED TCP/IP

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hrs/week	Theory: 100 Marks
	Total Credits : 03

1. **Introduction to Client-Server environment**
   Introduction Client-Server model, complexity of servers, RARP servers, UNIX IO paradigm and Network IO, Sending and Receiving data through a Socket, IP address manipulation routines, Obtaining Information about Host, Networks Protocols and Network services.

2. **BOOTP and DHCP-** BOOTP Operations, BOOTP Message format, DHCP Operations, DHCP Message format.

3. **Domain Name System -** Hierarchical Name space, Domain Name Space: Label. Domain name, FQDN, Distribution of Name space: Hierarchy of Name space, Zone, Root servers, DNS in the Internet, Resolution: Mapping Names to Address, Mapping Address to Names, Recursive resolution, Iterative resolution, caching, Types of Record: Resource record, Zone Delegation, Zone Transfer, DDNS

4. **TELNET and Rlogin-** Concept of Telnet, Telnet Protocol and options, Timesharing Environments, Network Virtual Terminals (NVT), Mode of operations, Rlogin

5. **File Transfer Protocol-** FTP, FTP features, process model, TFTP, NFS implementation, RPC.

6. **Simple Mail Transfer Protocol-** SMTP, User Agent, Addresses, Mail Transfer Agent, Mail transfer phases, MIME, Multi part messages, POP.

7. **Hyper Test transfer Protocols-** Architectural components, URL, HTTP transactions, Response Message, Header, WWW

8. **Voice Over IP (RTP)-** Real Time Transfer Protocol, RTP encapsulation, RTP Control protocol, operation, QoS, RSVP.

Reference Books:

1. Douglas Comer, Internetworking with TCP/IP, Principles, Protocols and Architecture, Volume 1, Pearson Education Asia
2. Behrouz Forouzan, TCP/IP Protocol suite, Tata McGraw-Hill Edition
3. Karnjit S. Siyan, Inside TCP/IP Techmedia
4. Pete Loshin, TCP/IP Clearly Explained, Morgan Kaufmann Publications

ELECTIVE-II

510305A WIRELESS TECHNOLOGY

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hrs/week	Theory: 100 Marks
	Total Credits : 03

1. **Transmission Fundamentals:**
   Signals for conveying Information, Analog & Digital Data Transmission, Channel Capacity, Transmission Media Multiplexing.

2. **Antennas and Propagation:**
   Antennas, propagation modes, Line -Of-Sight Transmission.

3. **Wireless Standards**
   IEEE 802.11a/b/g and IEEE 802.15, 16: Introduction to wireless networking, Nomenclature & Design, Types of networks: Satellite, GSM, Network Operation. Challenges for the MAC, MAC Access Modes and Timings, Contention-Based Access using the DCF. 802.11 frames.

4. **Wifi & Wi-Max & Bluetooth**

5. **Advanced Wireless Protocols**
   WEP: WEP Cryptographic Operations, WEP Data processing, Problems with WEP.
   EAP: EAP formats, Working of EAP.
   Mobile IP, TCP-Snoop, M-TCP.

References:

1. Wireless Communications and Networks, William Stallings, Pearson Education.
2. 802.11 Wireless Networks, The definitive Guide, O'Reilly Publications.

ELECTIVE- II

510305B Information Security Audit and Management

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hrs/week	Theory: 100 Marks
	Total Credits : 03

Objectives: After completing the course, students will be able to:

- Identify and prioritize information assets
- Identify and prioritize threats to information assets
- Define an information security strategy and architecture
- Plan for and respond to intruders in an information system
- Describe legal and public relations implications of security and privacy issues
- Present a disaster recovery plan for recovery of information assets after an incident

Syllabus

- **Introduction to the management of Information security**
- **Planning for Security**
- **Planning for Contingencies**
- **Information security policy**
- **Developing the Security Program**
- **Security management Models and Practices**
- **Risk Management : Assessing and controlling risk**
- **Protection mechanism**
- **Personnel and security**
- **Law and Ethics**
- **Information Security Project Management**

References:

1. Whitman & Mattord. *Management of Information Security*. Thomson Course Technology (2004). ISBN: 0-619-21515-1
2. An Introduction to Computer Security: The NIST Handbook
3. Security Self-Assessment Guide for Information Technology Systems
4. Risk Management Guide for Information Technology Systems
5. Contingency *Planning Guide for Information Technology Systems*

510306 Laboratory Practice – I

Teaching Scheme
Practicals: 6 Hrs/week

Examination Scheme
Term Work: 50 Marks
Total Credits : 03

Experiments/Assignments based on 510302 and 510305 and/or small project. The lab in charge should frame minimum of five assignments.

510307 Seminar – I

Teaching Scheme
Practicals: 4 Hrs/week/student

Examination Scheme
Term Work: 50 Marks
Total Credits : 02

Seminar on state-of-art topic.

510308 Operating System Design

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hrs/week	Theory: 100 Marks
	Total Credits : 03

1. Overview of Basic Concepts

Evolution of Operating Systems and Its Basic Services – Process Management; Memory Management; File Management; Protection and Security of Resources; User Interface through System Calls; Virtual System Image. Review of the Basic Concepts of Process Management, Memory Management and File Management.

2. Process Management and CPU Scheduling

Creation, Suspension and Termination of Processes; Process State Preservation for Restarting a Suspended Process; CPU Scheduling in Uniprocessor and Multiple Processor Systems; Process Migration Policies and Mechanisms; Real-Time Scheduling; Multithreading and Threads Scheduling.

3. Interprocess Communication (IPC)

Need for IPC among Cooperating Processes; IPC between Processes on a Single Computer System (Shared Memory Approach); IPC between Processes on Different Systems (Message Passing Approach); Synchronous and Asynchronous IPC; Buffer Management Strategies; Group Communication

4. Concurrency and Synchronization

Need for Concurrency and Mutual Exclusion; Critical Section Problem; Software Approaches for Mutual Exclusion; Hardware Support for Mutual Exclusion; Semaphore; Monitors; Classical Problems of Synchronization.

5. Deadlocks

System Model; Necessary Conditions for Deadlock, Deadlock Modeling using Resource Allocation Graph and Wait-for Graph; Deadlock Handling Mechanisms – Avoidance, Prevention; Detection and Recovery; Ways for Recovery from Deadlock; Issues in Recovery from Deadlock – Victim(s) Selection, Use of Transaction Mechanism to Rerun a Killed/Rolled-back Process.

6. File Management

File Management in Multiprocessor Systems – Caching, Replication, and Migration; File Sharing Semantics and Consistency Control Mechanisms; Stateful and Stateless File Servers; Directories and Directory Management.

7. Protection and Security

Potential Attacks to Computer Systems; Operating System Level Security Mechanisms; User Authentication Mechanisms – Proof by Knowledge, Proof by Possession, Proof by Property; Password Protection Mechanisms; Access Control Mechanisms – Protection Domains, Access Matrix, Access Control Lists, Capabilities;

Access Validation, Granting Rights, Passing Rights and Rights Revocation in Case of ACLs and Capabilities.

8. Case Study: Unix Operating System

Process Management, File Management and Memory Management in Unix; IPC Mechanisms in Unix – Pipes, Message Queues, Shared Memory, Sockets; Unix Kernel Support and APIs for Shared Memory; Unix Kernel Support and APIs for Semaphores; User Authentication and Access Control Mechanisms in Unix.

Reference Books

1. A. S. Tanenbaum, "Modern Operating Systems", Pearson/PHI
2. William Stallings, "Operating Systems – Internals and Design Principles", 5th Edition, Pearson/PHI
3. Pradeep K. Sinha, "Distributed Operating Systems – Concepts and Design", Prentice Hall of India
4. Abraham Silberschatz, Peter B. Galvin and Greg Gagne, "Operating System Concepts", 7th Edition, Addison Wesley
5. D. M. Dhamdhere, "Operating System Concepts", Tata McGraw Hill
6. Sumitabha Das, "Unix Concepts and Applications", 3rd Edition, Tata McGraw Hill
7. W. Richard Stevens, "Advanced Programming in the Unix Environment", Addison Wesley.

510309 High Performance Database Systems

Teaching Scheme
Lectures: 3 Hrs/week

Examination Scheme
Theory: 100 Marks
Total Credits : 03

1. High performance Issues and concerns in databases, Database Tuning and Performance: benchmarking, TPC benchmarks, object oriented benchmarks; TP Monitors, Object Transaction Management
2. Query Optimization: Physical layer, Access Methods, Query Optimization, DBMS buffers, caches, and optimisation high level query languages and low level primitive operations, join algorithms.
3. Advanced concepts in Transaction Management: ACID properties, pessimistic locking, optimistic locking, flat transactions, nested t5ransactions, deadlock detection and management; Recovery: write-ahead logging, shadow paging; Indexing structures: Btrees, hash files, multi-attribute indexing; Distributed databases, Schemas, Architectures, Queries, Transactions
4. Data warehousing: Heterogeneous information; the integration problem; the Warehouse Architecture; Data Warehousing; Warehouse DBMS, Data Warehouse Models and OLAP operations. ETL, materialized views, Dashboards, BI
5. SQL Extensions: Aggregations, SQL 3 , SQL 2006 XML integration
6. Data Mining: KDD process, Data mining applications, Data mining Techniques and Algorithms
7. Emerging trends in databases: Active and Deductive databases, Main Memory databases, OR Databases, Semantic databases
8. Emerging database technology case studies: XML, Hibernate, Directory services and LDAP

Reference Books

1. Avi Silberschatz, Henry F. Korth, S. Sudarshan “Database System Concepts”, Fifth Edition, TMH
2. Thomas Connolly, Carolyn Begg, “Database Systems: A Practical Approach to Design, Implementation and Management “, 3rd edition, Pearson Education, LPE
3. Raghu Ramakrishnan, Johannes Gehrke, “Database Management Systems”,
4. Jiawei Han, Micheline Kamber, “Data Mining”, Second Edition, Elsevier
5. Ian H. Witten, Eibe Frank, “Data Mining: Practical Machine Learning Tools and Techniques”, Second Edition, (Morgan Kaufmann Series in Data Management

510310 Advanced Software Engineering

Teaching Scheme
Lectures: 3 Hrs/week

Examination Scheme
Theory: 100 Marks
Total Credits : 03

1. Introduction to Software Engineering

Introduction, Socio-technical Systems, Dependability, Software Processes, Software Requirements, RE Processes, Systems Models, Critical Systems Specification, Formal Specification

2. Design Engineering
Architectural Design, Distributed Systems Architecture, Application Architectures Object-oriented Design, Real-time Systems, User Interface Design

3. Software Development Methodologies
Iterative Software Development, Software Reuse, CBSE, Critical Systems Development Software Evolution

4. Software Management
Verification and Validation, Software Testing, Critical Systems Validation, Managing People, Software Cost Estimation, Quality Management, Process Improvement, Configuration Management

5. Alternative Paradigms
Extreme Programming, Agile Software Engineering, Clean Room Software Engineering, Introduction to Formal Methods, soft systems

6. Advanced Software Engineering Process
Software Process Improvement, Software Economics, Software Quality, Software Metrics, Software Maintenance, Risk management, Requirement Engineering

Reference Books:

1. Software Engineering, Ian Sommerville, 8th Edition, Addison-Wesley, 2006,ISBN-10: 0321313798, ISBN-13: 9780321313799
2. Software Engineering: A Practitioner's Approach, 6/e, Roger S Pressman, McGraw Hill, 2005, ISBN: 0072853182

ELECTIVE-III

510311A Network Programming

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hrs/week	Theory: 100 Marks
	Total Credits : 03

1. The Transport Layer: TCP and UDP with policy control

TCP Connection Establishment and Termination, TIME_WAIT State, Port Numbers, Concurrent Servers, Buffer Sizes and Limitations.

2. Sockets and Socket Programming

Introduction, Socket Address Structures, Value-Result Arguments, Byte Ordering Functions, Byte Manipulation Functions, socket Function. TCP Client-Server: TCP Echo Server, TCP Echo Client, Crashing of Server Host, Crashing and Rebooting of Server Host, Shutdown of Server Host. UDP Sockets: UDP Echo server, UDP Echo Client.

3. Routing Sockets

Datalink Socket Address Structure, Reading and Writing, Interface Name and Index Functions

4. Name and Address Conversions

Domain Name System, Functions. Advanced Name and Address Conversions: Functions and Implementation

5. IPv4 and IPv6 Interoperability

IPv4 Client, IPv6 Server, IPv6 Client, IPv4 Server, IPv6 Address Testing Macros, IPV6_ADDRFORM Socket Option

6. Multicasting and Broadcasting

Broadcast Addresses, Unicast versus Broadcast, Multicasting: Multicast Addresses, Multicasting versus Broadcasting on A LAN, Multicasting on a WAN, Multicast Socket Options, Simple Network Time Protocol, SNTP.

7. Threads

Thread Functions: Creation and Termination, TCP Echo Server, Thread-Specific Data, Web Client and Simultaneous Connections

8. Client-Server Design Alternatives

TCP Client Alternatives, TCP Test Client, Iterative Server, Concurrent Server, Thread Locking around accept, TCP Preforked Server, Descriptor Passing, TCP Concurrent Server, One Thread per Client, TCP Prethreaded Server.

Reference Books:

1. Richard Stevens, Bill Fenner, "UNIX network programming Volume-1 - The Sockets Networking API", 3rd edition.

2. W. Richard Stevens, “Advanced Programming in the Unix Environment”, Addison Wesley.
3. UNIX Internals – “A new Frontier” , PHI

ELECTIVE-III

510311B Network Design, Modeling and Analysis

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hrs/week	Theory: 100 Marks
	Total Credits : 03

1. Essentials of Probability

Probability on a Sample Space, Basic Operations on Events, Probability on Events, Other Properties, Conditional Probability, Bayes Formula ,Independence, Random Variables, Random Variable as a Measurement, Probability Mass Function for a Random Variable, Cumulative Distribution Function, PMF and CDF for the 3 Coin Toss Example, Expectation of a Random Variable, Important Random Variables, Bernoulli Random Variable, Binomial Random Variable, Geometric Random Variable, Poisson Random Variable, Continuous-valued Random Variables, Properties of Continuous Random Variables, Expectation of a Continuous Random Variable, Important Continuous Random Variable: Exponential, Memory less Property of the Exponential

2. Delay Models in Data Networks

Multiplexing of Traffic on a Communication Link**,** Queuing Models- Little’s Theorem**,** Little’s Theorem**,** Probabilistic Form of Little’s Theorem**,** Application of Little’s Theorem**,** The M/M/1 Queuing System**,** Arrival Statistics, Service Statistics**,** Markov Chain Formulation**,** Deviation of the Stationary Distribution**,** Occupancy Distribution upon Arrival**,** Occupancy Distribution upon Departure**,** The M/M/m, M/M/∞, M/M/m/m, AND Other Markov Systems**,** The M/M/m: The m-Server Case**,** M/M/∞: The Infinite-Server Case**,** M/M/m/m: The m-Server Loss System**,** ltidimensional Markov Chains- Applications in Circuit Switching, The M/G/1 System, M/G/1 Queues with Vacations**,** Reservations and Polling**,** Priority Queuing

3. Inside an IMP

Queuing in the Network Layer at an IMP, Basic Single Queue Model, Applications of Queuing Analysis Outside of Networking, The Poisson Arrival Model, Properties of a Poisson Process, Interarrival Times of a Poisson Process, The M/M/1 Queue, Aside: Queuing Notation, Aside: The D/D/1 Queue, State Analysis of an M/M/1 Queue, Balance Equations , Solving the Balance Equations, The Finite Buffer Case: M/M/1/N, Blocking Probability and the Right Size Buffer, Throughput in the Finite Buffer Case, Alternate way to compute throughput of M/M/1/N: Look at the output side, Aside: Derivation of = Using Throughput, Approximation of a Finite Buffer System by the Infinite Buffer Model, How Long is That Line?, Little's Formula and Queuing Delay, Applying Little's Formula to an M/M/1 Queue, Applying the M/M/1 Results to a Single Network Link, Other Queuing Models

4. Network Design

Problem definition : Multipoint line layout heuristics, CMST algorithm, ESAU-William's algorithm, Sharma's algorithm, Unified algorithm, Bin packing, Terminal assignments, Concentrator location

5. Network Analysis

Queuing Networks, Closed Queuing Network Example, Nodes in a Packet Switched Network (PSN), Queuing Network Model of Nodes in a PSN, Queuing Network Analysis of a PSN, performance analysis of Data Link Layer, Network layer, QoS,

6. Network Administration

Functions and responsibilities, Network planning and implementation, Sub-netting, Bandwidth management, security issues, Tools for BW and security management, modifying network implementation

Reference Books

1. Kershenbaum A., "Telecommunication Network Design Algorithms", Tata McGraw Hill
2. Keshav S., "An Engineering Approach to Computer Networking," Addison-Wesley,1997.
3. Bertsekas D. and Gallager R., "Data Networks," 2nd Ed., Prentice-Hall, Englewood Cliffs, N.J., 1992.
4. Vijay Ahuja, "Design and Analysis of Computer Communication Networks", McGraw Hill
5. Stallings W., "High Speed Networks and Internet : Performance and Quality of Service", Prentice-
Hall
6. Zacker, "Networking – The Complete Reference", Tata McGraw Hill

ELECTIVE-IV
510112A Infrastructure Management

Teaching Scheme
Lectures: 3 Hrs/week

Examination Scheme
Theory: 100 Marks
Total Credits : 03

1. **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

2. **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)

3. **Service Delivery Processes**
   Service-level management, financial management and costing, IT services continuity management, Capacity management, Availability management

4. **Service Support Processes**
   Configuration Management, Service desk, Incident management, Problem management, Change management, Release management

5. **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

Reference Books:

1. Foundations of IT Service Management: based on ITIL, by Jan Van Bon, Van Haren Publishing, 2nd edition 2005
2. Floyd Piedad, Michael Hawkins, "High Availability: Design, Techniques, and Processes", Prentice Hall, 2000
3. Harris Kern, Stuart Galup, Guy Nemiro, "IT Organization: Building a Worldclass Infrastructure", Prentice Hall, 2000
4. Rich Schiesser, "IT Systems Management: Designing, Implementing, and Managing World-Class Infrastructures", Prentice Hall PTR; 2001

ELECTIVE-IV

510312B CONVERGENCE TECHNOLOGIES.

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hrs/week	Theory: 100 Marks
	Total Credits : 03

1. **Convergence Standards and Protocols**:
   Why Convergence, Identifying benefits of Converged network, Voice Packetization, Voice Compression (G.711,G.726,G.729 Etc), Switching basics, Circuit Switching Vs Packet Switching, Identify capabilities of T carrier systems

2. **Switching Networks**:
   ISDN (Concept, services, architecture, protocol overview etc.), Overview Of Frame Relay Networks, B-ISDN

3. **ATM Technology** :
   ATM VPI and VCI Creation of virtual channels ,Definition of Switched Virtual Circuit and Permanent Virtual Circuit ,Step-by-step PVC example of how an ATM network processes cells ,Step-by-step SVC example of how an ATM network processes cells ,Connection Admission Control (CAC) ,Cell Loss Priority (CLP) ,SVC signaling - Q.2931 ,Adaptation layers from a Voice over ATM perspective ,AAL1 , AAL2 ,AAL5 .

4. **Access Signaling Types:**
   Interconnection of voice gateways & IP, ATM, and Frame Relay networks. Learn which protocol is best for key systems, ISDN Q.931 signaling protocol ,How PRI and BRI use Q.931signaling ,Q.931 call setup process ,Comparison of signaling protocols based on ISDN's Q.931,MEGACO, ATM Q.2931, H.323, SS7.

5. **VOIP Convergence**:
   IP telephony basics, VOIP and its features and benefits, Overview of VOIP technology (including access gateways), Quality Of service and VOIP.

6. **Network Convergence:**
   Characteristics of the H.323 protocol, Identify the key benefits of Session Initiation Protocol, SIP components and messages, Media Gateway Control Protocol (MGCP), Overview of NetMeeting,

References:

1. Multimedia Communications Directions and Innovations By Jerry Gibson Academic Press
2. Multimedia Communication Systems techniques Standards and Networks By K.R.Rao Zoran Bojkovic and Dragorad Milovanovic Pearson Education
3. VOIP by Ulyess Black
4. ATM Networks Concepts and Protocols by Sumeet Kasera and Pankaj Sethi Tata McGraw

Hill

5. ISDN and Broadband ISDN with Frame relay and ATM 4/e by William Stallings Prentice Hall Publication.

510312C Open Elective (Self Study)**

Teaching Scheme	**Examination Scheme**
Lectures: 3hrs/week	Theory: 100 Marks
	Total Credits : 03

** - BoS Computer Engineering will declare the list of subjects which can be taken under Open elective

510313 Laboratory Practice – II

Teaching Scheme	**Examination Scheme**
Practicals: 6 Hrs/week	Term Work: 50 Marks
	Total Credits : 03

Experiments/Assignments based on 510308, 510309, 510311 and/or small project. The lab in charge should frame minimum of five assignments.

510314 Seminar – II

Teaching Scheme	**Examination Scheme**
Practicals: 4 Hrs/week/student	Term Work: 50 Marks
	Total Credits : 02

Seminar on state-of-art topic.

510315 Seminar – III

Teaching Scheme	**Examination Scheme**
Practicals: 04 Hrs/week/student	Term Work: 50 Marks
	Total Credits : 02

Seminar on Dissertation Topic.

510316 Project Stage – I

Teaching Scheme	**Examination Scheme**
Practicals: 18 Hrs/week/student	Term Work: 50 Marks
	Total Credits : 06

Project will consist of a System Development in Hardware/Software. Project work should be carried out using Software Engineering principles and practices.

510316 Project Stage – II**

Teaching Scheme	**Examination Scheme**
Practicals: 18 Hrs/week/student	Term Work: 200 Marks
	Total Credits : 12

** :- The Term Work of Project Stage-II will be assessed jointly by the pair of Internal and External examiner along with oral examination of the same.