Name of Subject : SYSTEM SOFTWARE (5 IT 1)	
Unit	**Contents**
I	Overview: Comparison of machine language, assembly language and high level languages, External and internal representation of instructions and data. Data allocation structures, search structures and addressing modes. Activities and system software for program generation, translation and execution. Editors for source code and object code/executable code files.
II	Assemblers: Assembly language specification. Machine dependent and independent features of assembler. Classification of assemblers. Pass structure of assemblers (problem and associated for IBM-PC.
III	Loader and Linkers: Functions and classification. Machine dependent and independent features of loaders, Design of bootstrap, absolute and relocatable loaders, Design of linker. Case study of MS-DOS linker.
IV	Macro processors: Macro definition, call and expansion. Macro processor algorithm and data structure. Machine independent features (parameters, unique labels, conditional expansion, nesting and recursion).Pass structure and design of microprocessor and macro assembler, Case study of MASM macro processor.
V	High level language processor: HLL specification: Grammars and parse trees, expression and precedence. Lexical analysis: Classification of tokens, scanning methods, character recognition, lexical ambiguity. Syntactic analysis: Operator precedence parsing, recursive descent parsing. Symbol Table Management: Data structure for symbol table, basing functions for symbols, overflow technique, block structure in symbol table.

Name of Subject: E-Commerce (5 IT 2)	
Unit	**Contents**
I	Introduction: Motivation, Forces behind E-Commerce Industry Framework, Brief history of Ecommerce, Inter Organizational E-Commerce Intra Organizational E-Commerce, and Consumer to Business Electronic Commerce, Architectural framework, Network Infrastructure for E-Commerce Network Infrastructure for E-Commerce, Market forces behind I Way, Component of I way Access Equipment, Global Information Distribution Network, Broad band Telecommunication.
II	Mobile Commerce: Introduction to Mobile Commerce, Mobile Computing Application, Wireless Application Protocols, WAP Technology, Mobile Information Devices, Web Security, Introduction to Web security, Firewalls & Transaction Security, Client Server Network, Emerging Client Server Security Threats, firewalls & Network Security.
III	Encryption: World Wide Web & Security, Encryption, Transaction security, Secret Key Encryption, Public Key Encryption, Virtual Private Network (VPM), Implementation Management Issues.
IV	Electronic Payments: Overview of Electronics payments, Digital Token based Electronics payment System, Smart Cards, Credit Card I Debit Card based EPS, Emerging financial Instruments, Home Banking, Online Banking.
V	Net Commerce: EDA, EDI Application in Business, Legal requirement in E – Commerce, Introduction to supply Chain Management, CRM, issues in Customer Relationship Management.

Name of Subject : DATABASE MANAGEMENT SYSTEMS (5 IT 3)	
Unit	**Contents**
I	INTRODUCTION TO DATABASE SYSTEMS: Overview and History of DBMS. File System v/s DBMS .Advantage of DBMS Describing and Storing Data in a DBMS. Queries in DBMS. Transaction management and Structure of a DBMS.
II	ENTITY RELATIONSHIP MODEL: Overview of Data Design Entities, Attributes and Entity Sets, Relationship and Relationship Sets. Features of the ER Model-Key Constraints, Participation Constraints, Weak Entities, Class Hierarchies, Aggregation, Conceptual Data Base, Design with ER Model-Entity vs Attribute, Entity vs Relationship Binary vs Ternary Relationship and Aggregation vs ternary Relationship Conceptual Design for a Large Enterprise.
III	RELATIONSHIP ALGEBRA AND CALCULUS**: Relationship Algebra Selection and Projection, Set Operations, Renaming, Joints, Division, Relation Calculus, Expressive Power of Algebra and Calculus.**
IV	SQL QUERIES PROGRAMMING AND TRIGGERS: The Forms of a Basic SQL Query, Union, Intersection and Except, Nested Queries ,Correlated Nested Queries, Set-Comparison Operations, Aggregate Operators, Null Values and Embedded SQL, Dynamic SQL, ODBC and JDBC, Triggers and Active Databases.
V	SCHEMA REFINEMENT AND NORMAL FORMS: Introductions to Schema Refinement, Functional Dependencies, Boyce-Codd Normal Forms, Third Normal Form, Normalization-Decomposition into BCNF Decomposition into 3-NF.

Name of Subject : COMPUTER ARCHITECTURE (5 IT 4)	
Unit	**Contents**
I	REGISTER TRANSFER LANGUAGE: Data movement around registers. Data movement from/to memory, arithmetic and logic micro operations. Concept of bus and timing in register transfer.
II	CPU ORGANISATION: Addressing Modes, Instruction Format. CPU organization with large registers, stacks and handling of interrupts & subroutines Instruction pipelining
III	ARITHMETIC ALGORITHM: Array multiplier, Booth's algorithm. Addition subtraction for signed unsigned numbers and 2's complement numbers.
IV	MICROPROGRAMMED CONTROL UNIT : Basic organization of micro-programmed controller, Horizontal & Vertical formats, Address sequencer
V	MEMORY ORGANISATION: Concept of RAM/ROM, basic cell of RAM, Associative memory, Cache memory organization, Vertical memory organization. I/O ORGANISATION: Introduction to Peripherals & their interfacing. Strobe based and handshake-based communication, DMA based data transfer, I/O processor.

Name of Subject : Advanced Software Engineering (5 IT 5)	
Unit	**Contents**
I	SOFTWARE CONFIGURATION MANAGEMENT: SCM Process, Objects in Software configuration, Version control, Change control, Configuration audit, Status reporting, SCM standards .SOFTWARE QUALITY ASSURANCE: Quality Concepts, Quality Movement, SQA Activities and Formal Approaches to SQA.
II	SOFTWARE TESTING AND DEBUGGING: Software Testing Fundamentals .Text Case Design ,White -Box Testing, Basis Path testing, Control Structure Testing, Black Box Testing and Testing for Specialized Environments, Architectures and Applications. Program Error, Debugging Process (Information Gathering, Fault Isolation, Fault Confirmation, Documentation, Fixing fault, Testing) Debugging Example.
III	MANAGING TEAM: Understanding behavior and selecting right person for the job, Motivation, working in groups, decision making, leadership and organizational structures. INTERNATIONAL STANDARDS: Importance and defining software quality, ISO 9126, BS 6079 planning steps, ISO 12207 approach to software lifecycle data.
IV	WEB ENGINEERING**: Attributes of Web-Based Applications. Process, Modeling activity, Analysis modeling for WebApps, Design- functional, information & interaction, testing WebApps- content, navigation, configuration, and performance testing.**
V	PROJECT MANAGEMENT FOR SPECIAL CLASSES OF SOFTWARE PROJECTS: Using CASE tools, CBSE, Re-engineering, forward engineering, client/server software engineering, outsourcing, Software project management standards. Change and Content Management of Web Engineering.

Name of Subject : ADVANCED DATA STRUCTURES (5 IT 6.1)	
Unit	**Contents**
I	ADVANCED TREES: Definitions Operations on Weight Balanced Trees (Huffman Trees), 2-3 Trees and Red- Black Trees. Augmenting Red-Black Trees to Dynamic Order Statistics and Interval Tree Applications. Operations on Disjoint sets and its union-find problem Implementing Sets. Dictionaries, Priority Queues and Concatenable Queues using 2-3 Trees.
II	MERGEABLE HEAPS: Mergeable Heap Operations, Binomial Trees Implementing Binomial Heaps and its Operations, 2-3-4. Trees and 2-3-4 Heaps. Amortization analysis and Potential Function of Fibonacci Heap Implementing Fibonacci Heap. SORTING NETWORK**: Comparison network, zero-one principle, bitonic sorting and merging network sorter.**
III	GRAPH THEORY DEFINITIONS: Definitions of Isomorphic Components. Circuits, Fundamental Circuits, Cut-sets. Cut-Vertices Planer and Dual graphs, Spanning Trees, Kuratovski's two Graphs.
IV	GRAPH THEORY ALGORITHMS**:** Algorithms for Connectedness, Finding all Spanning Trees in a Weighted Graph and Planarity Testing, Breadth First and Depth First Search, Topological Sort, Strongly Connected Components and Articulation Point. Single Min-Cut Max-Flow theorem of Network Flows. Ford-Fulkerson Max Flow Algorithms
V	NUMBER THEORITIC ALGORITHM: Number theoretic notation, Division theorem, GCD recursion, Modular arithmetic, Solving Linear equation, Chinese remainder theorem, power of an element, RSA public key Crypto system, primality Testing and Integer Factorization.

Name of Subject : SIMULATION AND MODELING (5 IT 6.2)	
Unit	**Contents**
I	System definition and components, Stochastic activities, continuous and discrete systems, System modeling, types of models, static and dynamic physical models, static and dynamic mathematical models, full corporate model, types of system study.
II	System simulation, why to simulate and when to simulate, basic nature of simulation, technique of simulation, comparison of simulation and analytical methods, types of system simulation, real time simulation, hybrid simulation, simulation of pure-pursuit problem single-server queuing system and an inventory problem, Monte- Carlo simulation, Distributed Lag models, Cobweb model.
III	Simulation of continuous systems, analog vs. digital simulation, simulation of water reservoir system, simulation of servo system, simulation of an autopilot. Discrete system simulation, fixed time-step vs. event-to-event model, generation of random numbers, test of randomness, generalization of non-uniformly distributed random numbers, Monte-Carlo computation vs. stochastic simulation.
IV	System Dynamics, exponential growth models, exponential decay models, modified exponential growth models, logistic curves, generalization of growth models, system dynamics diagrams, feedback in socio-economic systems and world models.
V	Simulation of PERT networks, critical path simulation, uncertainties in activity duration, resource allocation and consideration. Simulation software, simulation languages, continuous and discrete simulation languages, expression based languages, object-oriented simulation, general-purpose vs. application-oriented simulation packages, CSMP-III and MODSIM-III.

Name of Subject : IT FOR FORENSIC SCIENCES (5 IT 6.3)	
Unit	**Contents**
I	Overview of Biometrics, Biometric Identification, Biometric Verification, Biometric Enrollment, Biometric, System Security. Authentication and Biometrics: Secure Authentication Protocols, Access Control Security Services, Authentication Methods, Authentication Protocols, Matching Biometric Samples, Verification by humans. Common biometrics: Finger Print Recognition, Face Recognition, Speaker Recognition, Iris Recognition, Hand Geometry, Signature Verification, Positive and Negative of Biometrics. Matching: Two kinds of errors, Score distribution, Estimating Errors from Data, Error Rate of Match Engines, Definition of FAR and FRR.
II	Introduction to Information Hiding: Technical Steganography, Linguistic Steganography, Copy Right Enforcement, Wisdom from Cryptography Principles of Steganography: Framework for Secret Communication, Security of Steganography System, Information Hiding in Noisy Data , Adaptive versus non-Adaptive Algorithms, Active and Malicious Attackers, Information hiding in Written Text.
III	A Survey of Steganographic Techniques: Substitution systems and Bit Plane Tools, Transform Domain Techniques: - Spread Spectrum and Information hiding, Statistical Steganography, Distortion Techniques, Cover Generation Techniques. Steganalysis: Looking for Signatures: - Extracting hidden Information, Disabling Hidden Information.
IV	Watermarking and Copyright Protection: Basic Watermarking, Watermarking Applications, Requirements and Algorithmic Design Issues, Evaluation and Benchmarking of Watermarking system.
V	Transform Methods: Fourier Transformation, Fast Fourier Transformation, Discrete Cosine Transformation, Mellin- Fourier Transformation, Wavelets, Split Images in Perceptual Bands. Applications of Transformation in Steganography.

5 IT 7. SYSTEM SOFTWARE LAB
In this lab we will practice how source code is processed by compiler/ assembler/ pre-processor.
All programs have to be written in C++
1. Write a class for file handling, having functions to open/ read/ write/ close/ reset.
2 - 5. Develop a program which takes input a file of C language
(a) Print Lines of Codes and print signature of all function (including main)
(b) Print number of variables in every function (with type)
(c) Generate a new file without the comments. (/* */ and //)
(d) Process all #define (i.e. #define MAX 100, than replace every occurrence of MAX with 100).
(Macro value 100 can be an expression also.)
6. Write a program to create a symbol table.
7. Write a program which can parse a given C file and store all variables and functions in symbol table.
8 - 10. Write a program to convert given C program into RTL code.
Assumption
(a) Input C file will have only main function,
(b) Only two type of statements, either variable declaration statements
(int sub1=23;) OR mathematical expression (sub1 = sub2 - sub3 ;).
(c) System has 16 registers (R1 to R16)
(d) RTL opcode available are: ADD, LOAD, MOVE, SUB, MULTIPLY, DIVIDE
(e) No control-flow (i.e. if-else, loop, jump etc.) expression is there in input code e.g.
Int main ()
{
int sub1=72, sub2=85, sub3=63;
float per;
per=(sub1+sub2+sub3)/(100+100+100);
}

5 IT 8. E-COMMERCE LAB
1. Overview of Lab & Project.
2. Basics of HTML, DHTML, ASP and ASP data Connectivity.
3. Creation of the SQL server Database.
4. Creation of the ODBC connectivity.
5. Insertion/ modification of data with ASP.
6. Selection of data using Record sets.
7. Exercises using ASP/SQL
8. Exercises using MS FrontPage.
Mini Project in E-Commerce: Developing a small E-Commerce product catalog using ASP/MS SQL.

5 IT 9. DATABASE LAB

Student can use MySql (preferred open source DBMS) or any other Commercial DBMS tool (MS-Access / ORACLE) at backend and C++ (preferred) VB/JAVA at front end.

1. (a) Write a C++ program to store students records (roll no, name, father name) of a class using file handling. (Use C++ and File handling).

(b) Re-write program 1, using any DBMS and any compatible language.(C++/MySQL) (VB and MS-Access)

2. Database creation/ deletion, table creation/ deletion.

(a) Write a program to take a string as input from user. Create a database of same name. Now ask user to input two more string, create two tables of these names in above database.

(b) Write a program, which ask user to enter database name and table name to delete. If database exist and table exist then delete that table.

3. Write a program, which ask user to enter a valid SQL query and display the result of that query.

4. Write a program in C++ to parse the user entered query and check the validity of query. (Only SELECT query with WHERE clause)

5 - 6. Create a database db1, having two tables t1 (id, name, age) and t2 (id, subject, marks).

(a) Write a query to display name and age of given id (id should be asked as input).

(b) Write a query to display average age of all students.

(c) Write a query to display mark-sheet of any student (whose id is given as input).

(d) Display list of all students sorted by the total marks in all subjects.

7 - 8. Design a Loan Approval and Repayment System to handle Customer's Application for Loan and handle loan repayments by depositing installments and reducing balances.

9 -10. Design a Video Library Management System for managing issue and return of Video tapes/CD and manage customer's queries.

5 IT 10. UML LAB

Students are required to prepare various UML diagrams for any case study like Microwave Oven operation.

Following diagrams should be prepared:

1. Use case static structure diagram
2. Object and Class diagram
3. Sequence Diagram
4. Collaboration Diagram
5. State Chart Diagram
6. Activity Diagram
7 - 8. Component Diagram
9 -10. Deployment Diagram

Name of Subject : OPERATING SYSTEMS (6 IT 1)

Unit	Contents
I	Introduction to Operating Systems, Operating system services, multiprogramming, time-sharing system, storage structures, system calls, multiprocessor system. Basic concepts of CPU scheduling, Scheduling criteria, Scheduling algorithms, algorithm evaluation, multiple processor scheduling, real time scheduling I/0 devices organization, I/0 devices organization, I/0 devices organization, I/0 buffering.
II	Process concept, process scheduling, operations on processes, threads, inter-process communication, precedence graphs, critical section problem, semaphores, classical problems of synchronization. Deadlock problem, deadlock characterization, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock, Methods for deadlock handling.
III	Concepts of memory management, logical and physical address space, swapping, contiguous and non-contiguous allocation, paging, segmentation, and paging combined with segmentation.
IV	Concepts of virtual memory, demand paging, page replacement algorithms, allocation of frames, thrashing, demand segmentation. Security threads protection intruders-Viruses-trusted system.
V	Disk scheduling, file concepts, file access methods, allocation methods, directory systems, file protection, introduction to distributed systems and parallel processing case study.

Name of Subject COMPUTER NETWORKS (6 IT 2)	
Unit	**Contents**
I	Network, Network Protocols, Edge, Access Networks and Physical Media, Protocol Layers and their services models, Internet Backbones, NAP's and ISPs.
II	Application Layer: Protocol and Service Provided by application layer, transport protocols. The world wide web. HTTP, Message formats, User Server Interaction and Web caches. FTP commands and replies. Electronic Mail, SMTP, Mail Message Formats and MIME and Mail Access Protocols DNS The internet's directory service DNS records and Message.
III	Transport Layer: Transport Layer Service and Principles, Multiplexing and Demultiplexing applications, connectionless Transport. UDP Segment structure and UDP Checksum. Principles of Reliable Data Transfer-Go back to N and Selective Repeat. Connection Oriented Transport TCP Connection and Segment Structure, Sequence Numbers and acknowledgement numbers, Telnet, Round trip time and timeout. TCP connection management.
IV	Network Layer and Routing: Network service model, Routing principles. Link State routing Algorithm, A distant Vector routing & OSPF algorithm. Router Components; Input Prot, Switching fabric and output port. IPV6 Packet format. Point To Point Protocol (PPP), transition States, PPP Layers-Physical Layer and Data Link Layer, Link Control Protocols. LCP Packets and options. Authentication PAP and CHAP, Network Control Protocol (NCP).
V	Sonet/SDH:Synchronous Transport Signals. Physical configuration-SONET Devices, Sections, Lines and Paths. SONET Layers-Photonic Layer, section layer, line layer, path layer and device layer relationship. Sonnet Frame format. Section overhead, Line overhead and path overhead. Virtual Tributaries and types of VTs.

Name of Subject: DESIGN & ANALYSIS OF ALGORITHMS (6 IT 3)	
Unit	**Contents**
I	BACKGROUND: Review of Algorithm Complexity and Order Notations and Sorting Methods. DIVIDE AND CONQUER METHOD: Binary Search, Merge Sort, Quick sort and strassen's matrix multiplication algorithms. GREEDY METHOD: Knapsack Problem, Job Sequencing, Optimal Merge Patterns and Minimal Spanning Trees.
II	DYNAMIC PROGRAMMING: Matrix Chain Multiplication. Longest Common Subsequence and 0/1 Knapsack Problem. BRANCH AND BOUND: Traveling Salesman Problem and Lower Bound Theory. Backtracking Algorithms and queens problem.
III	PATTERN MATCHING ALGORITHMS: Naïve and Rabin Karp string matching algorithms, KMP Matcher and Boyer Moore Algorithms. ASSIGNMENT PROBLEMS: Formulation of Assignment and Quadratic Assignment Problem.
IV	RANDOMIZED ALGORITHMS. Las Vegas algorithms, Monte Carlo algorithms, randomized algorithm for Min-Cut, randomized algorithm for 2-SAT. Problem definition of Multicommodity flow, Flow shop scheduling and Network capacity assignment problems.
V	PROBLEM CLASSES NP, NP-HARD AND NP-COMPLETE: Definitions of P, NP-Hard and NP-Complete Problems. Decision Problems. Cook's Theorem. Proving NP-Complete Problems - Satisfiability problem and Vertex Cover Problem. Approximation Algorithms for Vertex Cover and Set Cover Problem.

Name of Subject : WEB TECHNOLOGY (6 IT 4)	
Unit	**Contents**
I	Introduction and Web Development Strategies History of Web, Protocols governing Web, Creating Websites for individual and Corporate World, Cyber Laws Web Applications, Writing Web Projects, Identification of Objects, Target Users, Web Team, Planning and Process Development.
II	HTML, XML and Scripting List, Tables, Images, Forms, Frames, CSS Document type definition, XML schemes, Object Models, Presenting XML, Using XML Processors: DOM and SAX Introduction to Java Script, Object in Java Script, Dynamic HTML with Java Script.
III	Java Beans and Web Servers Introduction to Java Beans, Advantage, Properties, BDK, Introduction to EJB, Java Beans API Introduction to Servelets, Lifecycle, JSDK, Servlet API, Servlet Packages: HTTP package, Working with Http request and response, Security Issues.
IV	Introduction to JSP, JSP processing, JSP Application Design, Tomcat Server, Implicit JSP objects, Conditional Processing, Declaring variables and methods, Error Handling and Debugging, Sharing data between JSP pages- Sharing Session and Application Data.
V	Database Connectivity Database Programming using JDBC, Studying Javax.sql.*package, accessing a database from a JSP page, Application-specific Database Action, Developing Java Beans in a JSP page, introduction to Struts framework.

Name of Subject : OPTICAL COMMUNICATION (6 IT 5)

Unit	Contents
I	Introduction to optical communication principles of light transmission optical fiber modes and configurations, Mode theory for circular wave-guides, Single-mode fibers, Multimode fibers, Numerical aperture, Mode field diameter, V- number, fiber materials, Fiber fabrication techniques.
II	Optical sources, LED'S, LASER diodes, Model reflection noise, Power launching and coupling, population inversion, fiber splicing, optical connectors, Photo-detectors, PIN, Avalanche detector, Response time, Avalanche multiplication noise.
III	Signal degradation in optical fibers, Attenuation losses, Signal distortion in optical wave guides, Material dispersion, Wave guide dispersion, Chromatic dispersion, Inter-modal distortion, Pulse broadening in Graded index fibers, Mode coupling, Advance fiber designs: dispersion shifted, Dispersion flattened, Dispersion compensating fibers, Design optimization of single mode fibers.
IV	Coherent optical fiber communication, Modulation techniques for Homodyne and Heterodyne systems, Optical filter link design. Rise time budget and link power budget, Long haul systems bit error rate, line coding, NRZ, RZ, Block Codes eye pattern.
V	Advance system and techniques, wavelength division multiplexing, optical amplifiers semiconductor amplifier, EDFA, Comparison between semiconductor and optical amplifier, Gain band width, Photonic switching, Optical Networks. Optical fiber bus, Ring topology, Star architectures, FDDI, SON-ET.

Name of Subject : DISTRIBUTED PROCESSING (6 IT 6.1)

Unit	Contents
I	CHARACTERIZATION OF DISTRIBUTED SYSTEMS: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. System Models: Architectural models, Fundamental Models Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks, Causal ordering of messages, global state, termination detection. Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.
II	DISTRIBUTED DEADLOCK DETECTION: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms. Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.
III	DISTRIBUTED OBJECTS AND REMOTE INVOCATION: Communication between distributed objects, Remote procedure call, Events and notifications, Java RMI case study. SECURITY: Overview of security techniques, Cryptographic algorithms, Digital signatures Cryptography pragmatics, Case studies: Needham Schroeder, Kerberos, SSL & Millicent. DISTRIBUTED FILE SYSTEMS: File service architecture, Sun Network File System, The Andrew File System, Recent advances.
IV	TRANSACTIONS AND CONCURRENCY CONTROL: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control. DISTRIBUTED TRANSACTIONS: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.
V	DISTRIBUTED ALGORITHMS: Introduction to communication protocols, Balanced sliding window protocol, Routing algorithms, Destination based routing, APP problem, Deadlock free Packet switching, Introduction to Wave & traversal algorithms, Election algorithm. CORBA CASE STUDY: CORBA RMI, CORBA services.

Name of Subject : ADVANCED COMPUTER ARCHITECTURES (6 IT 6.2)	
Unit	**Contents**
I	INTRODUCTION**: Parallel Computing, Parallel Computer Model, Program and Network Properties, Parallel** Architectural Classification Schemes, Flynn's & Feng's Classification, Performance Metrics and Measures, Speedup Performance Laws: Multiprocessor System and Interconnection Networks; IEEE POSIX Threads: Creating and Exiting Threads, Simultaneous Execution of Threads, Thread Synchronization using Semaphore and Mutex, Canceling the Threads.
II	PIPELINING AND MEMORY HIERARCHY: Basic and Intermediate Concepts, Instruction Set Principle; ILP: Basics, Exploiting ILP, Limits on ILP; Linear and Nonlinear Pipeline Processors; Super Scalar and Super Pipeline Design; Memory Hierarchy Design: Advanced Optimization of Cache Performance, Memory Technology and Optimization, Cache Coherence and Synchronization Mechanisms.
III	THREAD AND PROCESS LEVEL PARALLEL ARCHITECTURE: Introduction to MIMD Architecture, Multithreaded Architectures, Distributed Memory MIMD Architectures, Shared Memory MIMD Architecture, Clustering, Instruction Level Data Parallel Architecture, SIMD Architecture, Fine Grained and Coarse Grained SIMD Architecture, Associative and Neural Architecture, Data Parallel Pipelined and Systolic Architectures, Vector Architectures.
IV	Parallel Algorithms: PRAM Algorithms: Parallel Reduction, Prefix Sums, Preorder Tree Traversal, Merging two Sorted lists; Matrix Multiplication: Row Column Oriented Algorithms, Block Oriented Algorithms; Parallel Quicksort, Hyper Quick sort; Solving Linear Systems: Gaussian Elimination, Jacobi Algorithm; Parallel Algorithm Design Strategies.
V	Developing Parallel Computing Applications: OpenMP Implementation in 'C': Execution Model, Memory Model; Directives: Conditional Compilation, Internal Control Variables, Parallel Construct, Work Sharing Constructs, Combined Parallel Work-Sharing Constructs, Master and Synchronization Constructs; Run-Time Library Routines: Execution Environment Routines, Lock Routines, Timing Routines; Simple Examples in 'C'. Basics of MPI.

Name of Subject : IT INFRASTRUCTURE MANAGEMENT (6 IT 6.3)

Unit	Contents
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.
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).
III	SERVICE DELIVERY PROCESSES: Service-level management, financial management and costing, IT services continuity management, Capacity management, Availability management.
IV	SERVICE SUPPORT PROCESSES: Configuration Management, Service desk, Incident management, Problem management, Change management, Release management.
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.

6 IT 7. SHELL PROGRAMMING LAB

1. Practice commands: cp, mv, rm, ln, ls, who, echo, cat, mkdir, rmdir. Wildcards (?, *) , I/O redirection (<, >, >>), pipelines (|)
2. Practice commands: xargs, alias, set-unset, setenv-unsetenv, export, source, ps, job, kill.
3. Practice commands: head, tail, cut, paste, sed, grep, sort, uniq, find , locate, chmod.
4. Writing a simple shell script to echo who is logged in.
5. Write a shell script to display only executable files in a given directory.
6. Write a shell script to sort a list of file either in alphabetic order or largest file first according to user response.
7. Write a shell script to count the lines. Words and characters in its input (Note : Don't use wc).
8. Write a shell script to print end of a glossary file in reverse order using array. (Hint: use awk tail).
9. Modify cal command to accept more than one month (e.g. $cal Oct, Nov,)(Hint : use alias too)
10. Write a shell script to check whether Ram logged in, continue checking every 60 seconds until success.

6 IT 8. NETWORK LAB

The lab is to be conducted in Perl programming language, Perl works on all platforms (including windows)

1. Write few basic programs of Perl.

a. A Hello World Program

b. Write a program to add to 10 numbers.

c. Write a program of reading input from the keyboard and displaying them on monitor.

d. Write a program to take two strings as input and compare them

2. To understand advance constructs of Perl

a. Write a program to create a list of your course (all theory courses in current semester) using array and print them.

b. Write a program to accept ten number, store it into a hash table (Perl have itself) and when asked by user tell him that number exists or not. (do not store duplicate numbers)

c. Write a program to compute the number of lines in a file.

3. Find the IP address of a host or turn an IP address into a name.

4. Connect to an FTP server and get or put files. Automate the one-time transfer of many files to download the file everyday, which have changed since yesterday. (use Net:FTP)

5. Write a program to send mail. The programs should monitor system resources like disk space and notify admin by mail when disk space becomes dangerously low. (use Net:mail)

6. Fetch mail from a POP3 server (use Net:pop3)

7. Find out who owns a domain (use Net:whois , Whois is a service provided by domain name registration authorities to identify owners of domain names)

8. Test whether a machine is alive. Machine can be specified using IP address or domain name of machine.

9. Write a program to fetch content of a URL from a perl script, convert it to ASCII text (by stripping html tags) and display it.

10. Write program for TCP Server, TCP Client and create a sample code to show server-client communication over TCP.

6 IT 9. DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY WORK (TCS-553)
Programming assignments on each algorithmic strategy:
• Divide and conquer method (quick sort, merge sort, Strassen's matrix multiplication),
• Greedy method (knapsack problem, job sequencing, optimal merge patterns, minimal spanning trees).
• Dynamic programming (multistage graphs, OBST, 0/1 knapsack, traveling salesperson problem).
• Back tracking (n-queens problem, graph coloring problem, Hamiltonian cycles).
• Sorting : Insertion sort, Heap sort, Bubble sort
• Searching : Sequential and Binary Search
• Selection : Minimum/ Maximum, Kth smallest element

6 IT 10. WEB TECHNOLOGY LAB

1. 1 Development of static pages using HTML of an online Departmental Store. The website should be user friendly and should have the following pages:
   - ➢ Home page
   - ➢ Registration and user login
   - ➢ User profile page
   - ➢ Items catalog
   - ➢ Shopping cart
   - ➢ Payment by credit card
   - ➢ Order confirmation
2. Add validations to the above static pages of registration, user login, user profile and payment by credit card using Java Script.
3. Creation of a XML document of 20 students of III IT. Add their roll numbers, marks obtained in 5 subjects, total and percentage and save this XML document at the server. Write a program that takes students' roll number as an input and returns the students marks, total and percentage by t.aking the students' information from the XML document.
4. Creation of a JavaBean which gives the converted value of Temperature (in degree celcius) into equivalent Fahrenheit.
5. Creation of a simple Bean with a label – which is a "count" of number of clicks. Then create a BeanInfo class such that only the "count" is visible in the Property Window.
6. Creation of two Beans a) Keypad b) Display pad. After that integrate the two beans to make it work as a calculator.
7. Installation of TOMCAT web server. Convert the static web pages of assignments 2 into dynamic web pages using servlets and cookies.
8. Do the assignment 7 using JSP by converting the static web pages of assignment 2 into dynamic web pages. Create database with User Information and Item information. The Item catalog should be dynamically loaded from the database.
9. Implementation of "Hello World!" program using JSP Struts Framework

Name of Subject : MULTIMEDIA SYSTEMS (7 IT 1)

Unit	Contents
I	Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work. Convergence of Computer, Communication and Entertainment products and Stages of Multimedia Projects, Multimedia hardware, Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools.
II	Multimedia Building Blocks Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.
III	Data Compression Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding Higher Order Modeling. Finite Context Modeling, Dictionary based Compression, Sliding Window Compression, LZ77, LZW compression, Compression, Compression ratio loss less & lossy compression.
IV	Speech Compression & Synthesis Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression.
V	Images: Multiple monitors, bitmaps, Vector drawing, lossy graphic compression, image file formatic animations Images standards, JPEG Compression, Zig Zag Coding, Multimedia Database. Content based retrieval for text and images, Video: Video representation, Colors, Video Compression, MPEG standards, MHEG Standard Video Streaming on net, Video Conferencing, Multimedia Broadcast Services, Indexing and retrieval of Video Database, recent development in Multimedia

Name of Subject : COMPUTER GRAPHICS (7 IT 2)

Unit	Contents
I	Introduction to Raster scan displays, Storage tube displays, refreshing, flicking, interlacing, color monitors, display processors resolution, working principle of dot matrix, inkjet laser printers, working principles of keyboard, mouse scanner, digitizing camera, track ball , tablets and joysticks, graphical input techniques, positioning techniques, rubber band techniques, dragging etc.
II	Scan conversion techniques, image representation, line drawing, simple DDA, Bresenham's Algorithm, Circle drawing, general method, symmetric DDA, Bresenham's Algorithm, curves, parametric function, Beizier Method, B-sp-line Method.
III	2D & 3D Co-ordinate system, Translation, Rotation, Scaling, Reflection Inverse transformation, Composite transformation, world coordinate system, screen coordinate system, parallel and perspective projection, Representation of 3D object on 2D screen.
IV	Point Clipping. Line Clipping Algorithms, Polygon Clipping algorithms, Introduction to Hidden Surface elimination, Basic illumination model, diffuse reflection, specular reflection, phong shading, Gourand shading ray tracing, color models like RGB, YIQ, CMY, HSV etc.
V	Multimedia components, Multimedia Hardware, SCSI, IDE, MCI, Multimedia data and file formats, RTF, TIFF, MIDI, JPEG, DIB, MPEG, Multimedia Tools, Presentation tools, Authoring tools, presentation.

Name of Subject : ELECTRONIC DESIGN AUTOMATION (7 IT 3)

Unit	Contents
I	Introduction to VLSI, circuits Asics and Moore's Law. Microelectronic Design, Styles, four phases in creating Microelectronics chips computer Aided Synthesis and Optimization. Algorithms Review of Graph Definitions and Notations Decision and Optimization Problems, Shortest and Longest Path Problems, Vertex Cover, Graph, Coloring, Clique covering and partitioning Algorithms Boolean Algebra and Representation of Boolean Functions, binary Decision diagrams. Satisfiability and cover problems.
II	Hardware Modeling: Introduction to Hardware Modeling Language, State Diagrams. Data flow and Sequencing Graphs. Compilation and Behavioral Optimization Techniques. Circuits Specifications for Architectural Synthesis Resources and constraints. Fundamental Architectural Synthesis Problems Temporal Domain Scheduling Spatial Domain Binding Hierarchical Models and Synchronization Problem. Area and performance estimation-Resource Dominated circuits and General Circuits.
III	Scheduling Algorithms: Model for Scheduling Problems, Scheduling without Resource, Constraints-Unconstrained Scheduling ASAP Scheduling Algorithms Latency. Constrained Scheduling. ALAP scheduling. Under Timing Constraints and Relative Scheduling with Resource Constraints Integer Linear Programming Model, Multiprocessor Scheduling, Heuristic Scheduling Algorithms (List Scheduling). Force Directed Scheduling.
IV	Two Level Combination Logic Optimization: Logic Optimization Principles-Definitions, Exact Logic Minimization, Heuristic, Logic Minimization, and Testability Properties Operations on Two level logic Cover-positional Cube Notation, Functions with Multivolume inputs and list oriented manipulation. Algorithms for logic minimization.
V	Introduction to VHDL: VHDL History and capabilities program Structure of VHDL Entity, Architecture and package Declarations. Basic Language Elements, Identifier, Data objects, Data Types and Operator Behavioral Modeling- process variable Assignment, Signal Assignment and Wait Statements. Assertion Loop, if, case and next Statement Block and concurrent Assertion statements structural specifications of Hardware-inverter, Nand Gate Models, Comparator and Test Bench Modeling.

Name of Subject: WIRELESS COMMUNICATION (7 IT 4)	
Unit	**Contents**
I	Introduction: Cellular revolution, Global Cellular Network, Broad band and troubles with wireless. Principles of Cellular networks, First generation analog Second generation TDMA and Third generation systems.
II	Cordless Systems And Wireless Local Loops: Cordless systems, Wireless local loop and IEEE 802. 16 Fixed Broadband Wireless Access standards. Mobile IP, Wireless Application Protocol, Internet Control Message Protocol and Message Authentication.
III	Satellite Systems: Application Basics-GEO, LEO and MEO Introduction to Mobile Satcom. Routing, Localization and Handover.
IV	Broad Cast Systems: Overview, Cyclic repetition of data, Digital audio broadcasting-mobile object transfer protocol. Digital video broadcasting.
V	Wireless LAN: Infrared vs radio transmission, Infrastructure and ad hoc networks, IEEE 802. 11-System architecture, protocol architecture, Physical layer, Medium access control layer and MAC management. HIPER LAN-protocol architecture, physical layer channel access control sub layer, information bases and networking. Bluetooth-User scenarios, Physical layer, MAC Layer, Networking, Security and Link Management.

Name of Subject : INFORMATION PROTECTION AND SECURITY (7 IT 5)	
Unit	**Contents**
I	Introduction to security attacks, services and mechanism, introduction to cryptography. Conventional Encryption: Conventional encryption model, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers. Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, IDEA encryption and decryption, strength of IDEA, confidentiality using conventional encryption, traffic confidentiality, key distribution, random number generation.
II	Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler's theorem, primality testing, Euclid's Algorithm, Chinese Remainder theorem, discrete logarithms. Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffle-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elganel encryption.
III	Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA). Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm.
IV	Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME.
V	IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Web Security: Secure socket layer and transport layer security, Secure Electronic Transaction (SET). System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems.

Name of Subject : WEB SERVICES (7 IT 6.1)	
Unit	**Contents**
I	SOA Fundamentals: Defining SOA, Business Value of SOA, Evolution of SOA, SOA characteristics, concept of a service in SOA, misperceptions about SOA, Basic SOA architecture, infrastructure services, Enterprise Service Bus (ESB), SOA Enterprise Software models, IBM On Demand operating environment.
II	Web services Technologies: XML technologies – XML, DTD, XSD, XSLT, XQuery, XPath Web services technologies - Web services and SOA, WSDL, SOAP, UDDI WS Standards (WS-*) - Web services and Service- oriented enterprise (SOE), WS-Coordination and WS-Transaction, Business Process Execution Language for Web Services (BPEL4WS), WS-Security and the Web services security specifications, WS-Reliable Messaging, WS-Policy, WS-Attachments.
III	SOA Planning and Analysis: Stages of the SOA lifecycle, SOA Delivery Strategies, service-oriented analysis, Capture and assess business and IT issues and drivers, determining non-functional requirements (e.g., technical constraints, business constraints, runtime qualities, non-runtime qualities), business centric SOA and its benefits, Service modeling, Basic modeling building blocks, service models for legacy application integration and enterprise integration, Enterprise solution assets(ESA) .
IV	SOA Design and implementation: service-oriented design process, design activities, determine services and tasks based on business process model, choosing appropriate standards, articulate architecture, mapping business processes to technology, designing service integration environment (e.g., ESB, registry), Tools available for appropriate designing, implementing SOA, security implementation, implementation of integration patterns, services enablement, quality assurance.
V	Managing SOA Environment: Distributing service management and monitoring concepts, operational management challenges, Service-level agreement considerations, SOA governance (SLA, roles and responsibilities, policies, critical success factors, and matrices), QoS compliance in SOA governance, role of ESB in SOA governance, impact of changes to services in the SOA lifecycle.

Name of Subject : REAL TIME SYSTEMS (7 IT 6.2)	
Unit	**Contents**
I	Introduction: Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.
II	Real Time Scheduling: Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.
III	Resources Access Control: Effect of Resource Contention and Resource Access Control (RAC), Non-pre-emptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.
IV	Multiprocessor System Environment: Multiprocessor and Distributed System Model, Multiprocessor Priority-Ceiling Protocol, Schedulability of Fixed-Priority End-to-End Periodic Tasks, Scheduling Algorithms for End-to-End Periodic Tasks, End-to-End Tasks in Heterogeneous Systems, Predictability and Validation of Dynamic Multiprocessor Systems, Scheduling of Tasks with Temporal Distance Constraints.
V	Real Time Communication: Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols, Real Time Protocols, Communication in Multicomputer System, An Overview of Real Time Operating Systems.

Name of Subject : BIO-INFORMATICS (7 IT 6.3)

Unit	Contents
I	INTRODUCTION: Bioinformatics objectives and overviews, Interdisciplinary nature of Bioinformatics, Data integration, Data analysis, Major Bioinformatics databases and tools. Metadata: Summary & reference systems, finding new type of data online. MOLECULAR BIOLOGY AND BIOINFORMATICS: Systems approach in biology, Central dogma of molecular biology, problems in molecular approach and the bioinformatics approach, Overview of the bioinformatics applications.
II	THE INFORMATION MOLECULES AND INFORMATION FLOW: Basic chemistry of nucleic acids, Structure of DNA, Structure of RNA, DNA Replication, -Transcription, -Translation, Genes- the functional elements in DNA, Analyzing DNA,DNA sequencing. Proteins: Amino acids, Protein structure, Secondary, Tertiary and Quaternary structure, Protein folding and function, Nucleic acid-Protein interaction.
III	PERL: Perl Basics, Perl applications for bioinformatics- Bioperl, Linux Operating System, Understanding and Using Biological Databases, Java clients, CORBA, Introduction to biostatics.
IV	NUCLEOTIDE SEQUENCE DATA: Genome, Genomic sequencing, expressed sequence tags, gene expression, transcription factor binding sites and single nucleotide polymorphism. Computational representations of molecular biological data storage techniques: databases (flat, relational and object oriented), and controlled vocabularies, general data retrieval techniques: indices, Boolean search, fuzzy search and neighboring, application to biological data warehouses.
V	BIOLOGICAL DATA TYPES AND THEIR SPECIAL REQUIREMENTS: sequences, macromolecular structures, chemical compounds, generic variability and its connection to clinical data. Representation of patterns and relationships: alignments, regular expressions, hierarchies and graphical models.

7 IT 7. MULTIMEDIA LAB

1. Play two audio files. One is having English spoken digits and another having Hindi spoken digits. These files are played on a single system after sound robin mixing digits.

2. Program a presentation of circle and rectangle with audio description i.e. size, color of boundary and interior etc. played synchronously one after another.

3. An animation sequence is mixed with audio words. Every action is synchronized with pronunciation of the current action.(Note : A bat can be displayed as hit/miss sequence of ball played).

4. Present a Video file on 2 independent systems communicating through network without participation of server system of the network

5. To analyze a file having diagram .Compress it in some format . Transfer the file to other system through floppy. Decompress and display the original diagram: (Note: - Use bitmap format).

6. Make musical notes displayed on screen. That can be played with depressing the notes by mouse click.One by one.

7. Make a spelling checker in which PC speaks a word user enters this word through keyboard .On correct spelling PC gives applause , On wrong spelling it asks to retype the work, after 8-failures PC shows correct spelling

8. Make a math driller for primary school in which PC presents two or more numbers (Max. 10 nos) ask to perform addition, subtraction , multiplication ,division , searching max or minimum etc. User perform said operation and enters result through keyboard .On correct answer PC applauses else it asks to retry .After 8 failure PC gives correct answer

7 IT 8. COMPUTER GRAPHICS LAB

1. Implementation of line generation using slope's method, DDA and Bresenham's algorithms.

2. Implementation of circle generation using Mid-point method and Bresenham's algorithm.

3. Implementation of ellipse generation using Mid-point method.

4. Implementation of polygon filling using Flood-fill, Boundary-fill and Scan-line algorithms.

5. Implementation of 2D transformation: Translation, Scaling, Rotation, Mirror Reflection and Shearing (write a menu driven program).

6. Implementation of Line Clipping using Cohen-Sutherland algorithm and Bisection Method.

7. Implementation of Polygon Clipping using Sutherland-Hodgman algorithm.

8. Implementation of 3D geometric transformations: Translation, Scalind and rotation.

9. Implementation of Curve generation using Interpolation methods.

10. Implementation of Curve generation using B-spline and Bezier curves.

11. Implementation of any one of Back face removal algorithms such as Depth-Buffer algorithm, Painter's algorithm, Warnock's algorithm, Scan-line algorithm)

7 IT 9. ELECTRONIC DESIGN AUTOMATION LAB

1. Write a program which reads simple digital circuit (of size up to 10 gates) in blif / Boolean equation and display schematic in graphics format.

2. Write a program to convert Blif format into Boolean equation.

3. Write a program that estimate area of circuit (specified as Blif or Boolean equation) using library binding technique of simple circuit (up to 10 gates).

4. Write a program to implement state machine up to 5 states.

5. Write a program to count 4-input lookup table in a simple circuit (up to 10 gates specified as Blif or Boolean equation).

6. Write a program to obtain sequencing graph for a given set of arithmetic expression (up to 10 nodes)

7. Write VHDL Codes for all gates with all Modeling.

8. Write VHDL Codes & Test bench for half adder and full adder.

Name of Subject : DATA MININIG AND WAREHOUSING (8 IT 1)	
Unit	**Contents**
I	Overview, Motivation(for Data Mining),Data Mining-Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.
II	Concept Description: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi- Dimensional Association rules from Relational Databases.
III	What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods Knearest neighbor classifiers, Genetic Algorithm. Cluster Analysis: Data types in cluster analysis, Categories of clustering methods, Partitioning methods. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method –Statistical Approach, Neural Network approach, Outlier Analysis
IV	Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.
V	Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse.

Name of Subject : ERP SYSTEMS (8 IT 2)	
Unit	**Contents**
I	ERP Overview, Benefit, Business Process Reengineering, Data ware Housing, Data Mining, LAP, Supply chain Management.
II	ERP –A Manufacturing Perspective, ERP Module, ERP Market, ERP implementation life cycle, Options of various paradigms, Identification of suitable platforms, Role of SDLC/SSAD, Object oriented architecture.
III	ERP Implementation: introduction, pre evaluation screening, package evaluation, project planning phase. Gap analysis. Hidden costs, Vendors, Consultant Employees, Human Resource
IV	ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical Factors guiding selection and evaluation, Strategies for successful implementation, Impediments and initiatives to achieve success, Critical success and failure factors, Integrating ERP into organizational culture.
V	Using ERP tool: either SAP or ORACLE format to case study with example in any system.

Name of Subject : STORAGE AND INFORMATION MANAGEMENT (8 IT 3)	
Unit	**Contents**
I	**Introduction to Storage Technology: Data proliferation and the varying value of data with time & usage, Sources of data and states of data creation, Data center requirements and evolution to accommodate storage needs,** Overview of basic storage management skills and activities, The five pillars of technology, Overview of storage infrastructure components, Evolution of storage, Information Lifecycle Management concept, Data categorization within an enterprise, Storage and Regulations.
II	**Storage Systems Architecture: Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, Logical partitioning of disks, RAID & parity algorithms, hot sparing, Physical vs.** logical disk organization, protection, and back end management, Array caching properties and algorithms, Front end connectivity and queuing properties, Front end to host storage provisioning, mapping, and operation, Interaction of file systems with storage, Storage system connectivity protocols.
III	**Introduction to Networked Storage: JBOD, DAS, SAN, NAS, & CAS evolution, Direct Attached Storage (DAS)** environments: elements, connectivity, & management, Storage Area Networks (SAN): elements & connectivity, Fibre Channel principles, standards, & network management principles, SAN management principles, Network Attached Storage (NAS): elements, connectivity options, connectivity protocols (NFS, CIFS, ftp), & management principles, IP SAN elements, standards (SCSI, FCIP, FCP), connectivity principles, security, and management principles, Content Addressable Storage (CAS): elements, connectivity options, standards, and management principles, Hybrid Storage solutions overview including technologies like virtualization & appliances.
IV	**Introduction to Information Availability: Business Continuity and Disaster Recovery Basics, Local business continuity techniques, Remote business continuity techniques, Disaster Recovery principles & techniques.**
V	**Managing & Monitoring: Management philosophies (holistic vs. system & component), Industry management standards (SNMP, SMI-S, CIM), Standard framework applications, Key management metrics (thresholds,** availability, capacity, security, performance), Metric analysis methodologies & trend analysis, Reactive and pro- active management best practices, Provisioning & configuration change planning, Problem reporting, prioritization, and handling techniques, Management tools overview.

Name of Subject : MOBILE COMPUTING (8 IT 4.1)	
Unit	**Contents**
I	Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.
II	Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.
III	Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.
IV	Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.
V	Ad Hoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

Name of Subject : NETWORK PROGRAMMING (8 IT 4.2)	
Unit	**Contents**
I	Introduction TCP/IP:, internetworking concepts and architecture, ARP, RARP, Internet protocol (Datagram delivery, routing, (ICMP), CIDR, introduction of UDP and TCP, EGP, BGP, RIP, OSPF, HELLO, NAT, VPN, client server model, BOOTP, DHCP, NFS
II	Socket Programming: Socket Fundamentals, Elementary TCP & UDP sockets, I/O multiplexing, socket options, elementary name and address conversion.
III	Advanced Sockets: Introduction to IPV6, IPV4 AND IPV6 interoperability Advanced name and address conversion, Daemon processes and intend, Advanced I/O and non blocking I/O, Broadcasting, Threads and IP options.
IV	X/OPEN Transport Interface (XTI): TCP client and servers name and address functions, UDP client and servers, streams and virtual. Private Networks.
V	Advanced Topics: Inter-process communication-Introduction, POSIX IPC & System V IPC, Introduction to pipes & FIFOS, Doors and Sun RPC (Introduction only).

Name of Subject : ARTIFICIAL INTELLIGENCE (8 IT 4.3)	
Unit	**Contents**
I	Meaning and definition of artificial intelligence, Various types of production systems, Characteristics of production systems, Study and comparison of breadth first search and depth first search. Techniques, other Search Techniques like hill Climbing, Best first Search. A* algorithm, AO* algorithms etc, and various types of control strategies.
II	Knowledge Representation, Problems in representing knowledge, knowledge representation using propositional and predicate logic, comparison of propositional and predicate logic, Resolution, refutation, deduction, theorem proving, inferencing, monotonic and nonmonotonic reasoning.
III	Probabilistic reasoning, Baye's theorem, semantic networks scripts schemas, frames, conceptual dependency and fuzzy logic, forward and backward reasoning.
IV	Game playing techniques like minimax procedure, alpha-beta cut-offs etc, planning, Study of the block world problem in robotics, Introduction to understanding and natural languages processing.
V	Introduction to learning, Various techniques used in learning, introduction to neural networks, applications of neural networks, common sense, reasoning, some example of expert systems.

8 IT 5. DATA MINING AND WAREHOUSING LAB
The objective of the lab exercises is to use data mining techniques to use standard databases available to understand DM processes using any DM tool)
1. Gain insight for running pre- defined decision trees and explore results using MS OLAP Analytics.
2. Using IBM OLAP Miner – Understand the use of data mining for evaluating the content of multidimensional cubes.
3. Using Teradata Warehouse Miner – Create mining models that are executed in SQL. (
Portal work : The objective of this lab exercises is to integrate pre-built reports into a portal application)
4. Publish and analyze a business intelligence portal.
Metadata & ETL Lab: The objective of this lab exercises is to implement metadata import agents to pull metadata from leading business intelligence tools and populate a metadata repository. To understand ETL processes
5. Import metadata from specific business intelligence tools and populate a meta data repository.
6. Publish metadata stored in the repository.
7. Load data from heterogeneous sources including text files into a pre-defined warehouse schema.
Case study
1. Design a data mart from scratch to store the credit history of customers of a bank. Use this credit profiling to process future loan applications.
2. Design and build a Data Warehouse using bottom up approach titled 'Citizen Information System'.

8 IT 6. INDUSTRIAL ECONOMICS AND MANAGEMENT LAB
Industrial Economics:
1. Introduction: Nature and significance of Economics. Meaning of Science, Engineering and Technology and their relationship with economic development.
2. Basic Concept: The concept of demand and supply. Elasticity of Demand and Supply. Indifference Curve Analysis, Price Effect, Income Effect and Substitution Effect.
3. Money and Banking: Functions of Money, Value of Money, Inflation and measures to control it. Brief idea of functions of banking system, viz., Commercial and central banking, Business fluctuations.
Management:
4. Introduction: Definition, Nature and Significance of Management,. Evaluation of Management thought, Contributions of Max Weber, Taylor and Fayol.
5. Human Behavior: Factors of Individual Behavior, Perception, Learning and Personality Development, Interpersonal Relationship and Group Behavior.

8 IT 7 WEB PROGRAMMING LAB
1. Create web pages to understand the various server controls.
2. Create web pages to understand and use to validate user inputs.
3. Create web pages to learn how to navigate between web pages and servers.
4. Programming to learn data binding.
5. Create login form and validate it username/password stored in database.
6. Create student record and perform following operations:
   Add record, delete, and edit, search record, navigation between records.
7. A web application display product names and price in tabular formats. Each row containing product detail should display Know More button. When the button is clicked the description for the selected item should be displayed.