DEPARTMENT OF COMPUTER APPLICATION

SYLLABUS 2009

Ch. Charan Singh University, Meerut

B+ NAAC Certification

Department of Computer Application

Master of Computer Application (MCA)

Scheme / Syllabus (2009 onwards)

First Semester

Course No	Course Name
MCA-101	Computer Concepts and C programming
MCA-102	Computer Organization & Architecture
MCA-103	Management Information Systems
MCA-104	Communication and Presentation Skills
MCA-105	Mathematics I
MCA-106	Lab of PC Package Tools
MCA-107	Lab of Structured Language (C)

Second Semester

Course No	Course Name
MCA-201	Data Structures and File Organization
MCA-202	Operating System
MCA-203	Computer Graphics and Multimedia
MCA-204	Organizational Behavior & HR
MCA-205	Mathematics II
MCA-206	Graphics Lab
MCA-207	Data Structure Lab

Third Semester

Course No	Course Name
MCA-301	Mathematics III
MCA-302	Computer Networks
MCA-303	Database Management Systems
MCA-304	Theory of Computation
MCA-305	Object Oriented Programming Systems
MCA-306	DBMS Lab
MCA-307	OOPS Lab(C++)

Fourth Semester

Course No	Course Name
MCA-401	Software Engineering
MCA-402	Compiler Design
MCA-403	Design and Analysis of Algorithm
MCA-404	Elective-Ist from List A
MCA-405	Elective-IInd from List A
MCA-406	Software Engineering Lab
MCA-407	Design and Analysis of Algorithm Lab

List- A of electives for IVth Semester

(E-1) Cryptography and Network Security

(E-2) Client server computing

(E-3) Advanced Computer Architecture

(E-4) Mobile Computing

(E-5) Windows Programming

(E-6) Advanced Database Management System

(E-7) Foundation of E-Commerce

(E-8) System Modeling and Simulation

Fifth Semester

Course No	Course Name
MCA-501	**Internet and Web Technologies**
MCA-502	**Artificial Intelligence**
MCA-503	**Elective-Ist from list B**
MCA-504	**Elective-IInd from list B**
MCA-505	**Elective-IIIrd from list B**
MCA-506	**Artificial Intelligence Lab**
MCA-507	**Web Technologies Lab**

List- B of electives for Vth Semester

(E-9) Neural Networks

(E-10) Data mining and warehousing

(E-11) Virtual Reality

(E-12) Digital Image Processing

(E-13) Embedded Systems

(E-14) Real Time Systems

(E-15) Bio Informatics

(E-16) Software Reliability Engineering

Sixth Semester

Course No	Course Name
MCA-601	**Project Reports and Viva Vice**

Note:
Lectures of **Software Leaders, HR** from industries etc will be part of the programme.
Seminars and workshops related to IT field for the benefits of students will be arranged time to time during the course.
In case of Electives, the chosen elective which comes first in order according to the list is considered Elective-Ist and other Elective-IInd.

MCA -101 Computer Concepts & C Programming

Objective *- A programmer's life should begin with C. It's the first step that one should learn.*

Computer Appreciation : Computer system introduction ,Characteristics and classification of computers, Computer hardware Components, CPU, memory, keyboard, mouse, printers, monitors, Disk Storage, CD etc., and their functions, Programming Language classifications, Basic operating System Concepts.

Programming in C: History, Introduction to C Programming Languages, Structure of C programs, compilation and execution of C programs, Debugging Techniques, Data Types and Sizes, Declaration of variables, Modifiers, Identifiers and keywords, Symbolic constants, Storage classes (automatic, external, register and static), Enumerations, command line parameters, Macros, The C Preprocessor.

Operators: Unary operators, Arithmetic & logical operators, Bit wise operators, Assignment operators and expressions, Conditional expressions, Precedence and order of evaluation.
Control statements: if-else, switch, break, continue, the comma operator, goto statement.
Loops: for, while, do-while.

Functions: built-in and user-defined, function declaration, definition and function call, parameter passing: call by value, call by reference, recursive functions, multifile programs.
Arrays: linear arrays, multidimensional arrays, passing arrays to functions, Arrays and strings.

Structure and Union: Definition and Differences.
Pointers: Declaration, value at (*) and address of (&) operator, pointer to pointer, Dynamic Memory Allocation, calloc and malloc functions, array of pointers, function of pointers, structures and pointers.
File Handling in C: Opening and closing a data file, creating a data file, read and write functions, unformatted data files.

References:

1. Rajaraman V, "**Fundamentals of Computers**", PHI
2. Norton Peter, "**Introduction to Computers**", TMH
3. Hahn, "**The Internet complete reference**", TMH
4. Norton Peter, "**DOS Guide**", Prentice Hall of India
5. Gottfried, "**Programming in C**", Schaum's Series, Tata McGraw Hill
6. Kanetkar Yashwant, "**Let us C**", BPB
7. Ritchie Kernighan,, "**The C Programming Language**", PHI
8. Kanetkar Yashwant , "**Working with C**", BPB
9. Kanetkar Yashwant, "**Pointer in C**", BPB
10. Bajpai, Kushwaha, Yadav, "**Computers & C Programming**", New Age

MCA-102 Computer Organization and Architecture

Objective: - *Computer organization & architecture provides the basic knowledge necessary to understand the hardware operation of digital computers.*

Introduction: Organization and Architecture, Structure and functions, Different layers of a computer system and their interfaces.
Data Representation: Data Types, binary codes, Binary Coded Decimals, fixed point representation, floating point representation, error detection and correction codes, Overflow and Underflow.
Digital Logic Circuits : Digital Computers, Logic gates , Boolean algebra, Maps Simplification up to 4 variables, Combinational circuits-Half Adder and Full Adder, Flip-flops – SR Flip-flop, D Flip-flop, JK Flip-flop, T Flip-flop, Edge-Triggered Flip-flops, Master-Slave Flip-flops, sequential circuits – Flip-flop Input Equations, State Table, State Diagrams.
Digital Components : Integrated Circuits, Decoder-NAND Gate Decoders, Encoders, Multiplexes, Demultiplexers, Registers, Register with parallel mode, Shift Registers, Binary Counter, Memory Units-RAM, ROM and types of ROM.
Basic Computer Organization : Instruction codes – Stored Program and Organization, Indirect Address, Computer Registers, Computer Instruction-Instruction Format, Timing & Control, Instruction Cycle- Register Reference and Memory Reference Instructions, Input-Output and Interrupts.
Central Processing Unit : Introduction, General Register Organization, Stack Organization- Register Stack, Memory Stack, Reverse polish Notation, Evaluation of Arithmetic Expression, RISC and CISC Processor Characteristics.
Input – Output and Memory Organization : Peripheral devices, input – Output interface, I/O Bus, Isolated versus Memory Mapped I/O, Asynchronous data transfer, modes of data transfer, Memory hierarchy, main memory, auxiliary memory, cache memory.

Text & References:

(1) Mano, M "**Computer System and Architecture**", PHI.
(2) Ram, B. "**Computer Fundamentals, Architecture and Organization'',** New Age International (P) Ltd. Publishers.
(3) Pal Chaudhuri, P. "**Computer Organization & Design**", PHI.
(4) Malvino "**Digital Principals and Applications, 4/e**", Mc Graw Hill.
(5) Stallings,W "**Computer Organization & Architecture**", PHI.

MCA-103 Management Information Systems

Objective: *This course aims at describing what an information system is? And how to plan and control the information system needs of managers.*

Foundation of Information System: Introduction to Information System in Business, Fundamentals of Information Systems, Solving business problems with information systems, Types of Information Systems, Effectiveness and Efficiency Criteria in Information Systems.

An overview of Management Information Systems: Definition of Management Information System, MIS versus Data Processing, MIS and Decision Support Systems, MIS and Information Resources Management, End User Computing, Structure of a Management Information System.

Concepts of Planning and Control: Concept of Organizational Planning, The Planning Process, Computational Support for Planning, Characteristics of Control Process, The nature of Control in an Organization.

Business Applications of Information Technology: Internet and Electronic Commerce, Intranet, Extranet, and Enterprise Solutions, Information System for Business Operations, Information System for Managerial Decision Support, Information System for Strategic Advantage.

Managing Information Technology: Enterprise and Global Management, Security and Ethical Challenges, Planning and Implementation Changes.

Advanced Concepts in Information Systems: Enterprise Resource Planning, Supply Chain Management, Customer Relationship Management, Procurement Management.

References:

(1) Brian O, "**Management Information System**", TMH.
(2) Davis, Olson, "**Management Information System**", TMH.
(3) Jain Sarika, "**Information System**", PPM.

MCA-104 Communication and Presentation Skills

***Objective**: This course aims to import the techniques of convincing presentation of ideas / projects and to make the written / spoken communication more effective and intelligible.*

Communication: Meaning, Process, Types, Barriers, Non Verbal Communication and its importance.

Oral Presentation Skills: Principles or guidelines of oral Presentation
Use of word stress in English language and its importance.

Written Communication Skills: Essay and Précis writing, Preparation of Bibliography, Resume Writing, Formal and Informal Correspondence

The Skill of writing a Technical description: Describing machines and different processes.

The students should be asked to prepare and present seminars during the practice session. Group discussions should also be held and feedback given to the students.

The questions will be set on the theory part of communication, as well as on the practical application of the principles of communication. The students will be asked to describe the skills of communication and also to write essay, précis, resume, letter or bibliography etc.

MCA -105 Mathematics I

***Objective**: - Concepts & notations from discrete mathematics are useful in studying & describing objects & problems in computer algorithms & programming languages & have applications in cryptography, automated theorem proving & software development*

Groups and Subgroups: Set Theory, Relations and Functions. Group axioms, Permutation groups, Sub groups, Cosets, Normal sub groups, free semigroup, Monoids

Lattices: Lattices, Properties of Lattices, Hasse Diagram, Bounded Lattices, Distributive Lattices and Complemented Lattices.

Graphs: Directed and Undirected graphs, Subgraphs, Chains, Circuits, Paths, Cycles, Connectivity; Relation to partial ordering ; Adjacency and incidence matrices; minimal paths; Elements of transport network; Applications (flowcharts and state transition graphs, examples in coding theory , algorithms for determining cycles and minimal paths, decision trees, polish notation and trees, flow chart in networks)

Boolean algebras; Axiomatic definition of Boolean algebras as algebric structures with two operations; Duality; Basic results; Proposition and prepositional functions; logic connectives, Truth tables and truth values. The algebra of pre positional functions; The Boolean algebra of truth values; Applications (switching circuits, basic computer components, decision tables)

Finite Fields; Definition, representation, structure, Minimal Polynomials, Irreducible polynomials, Primitive elements, Polynomials roots

References

1. Korfhage, R.R.:"**Discrete Computational Structures**", Academic Press.
2. PREPARATA, F.P., YEH, R. T.:"**Introduction to Discrete Structures**",Addition –Wesley.
3. TREMBLEY, J.P and MANOHAR, R.P:"**Discrete Mathematical Structures with Applications to Computer science**" McGraw Hill.
4. Prather, R. E.: "**Discrete Mathematical structures for Computer Science**", Hoghton Mijjlin.
5. Kolman, B and Busby, R "**Discrete Mathematical Structures for Computer Science** "Prentice Hall.
6. Sahni,S "**Concepts in Discrete Mathematics**" Camelot Publisher U.S.A.

MCA - 106 Lab of PC Package Tools

In PC package lab, students would be introduced with basic computer working.

1. Basic operating system windows working environment.
2. Introducing the start menu and programs available in it, starting working on paint-brush utility to make student fast learn how to handle mouse.
3. Working hand various office component available in detail like Ms Word, Ms Excel, and Ms Power Point.
4. Initial and basic DOS OS Commands.
5. Introduction to HTML Language and its basic tags to make static pages as form, table, and simple text data formatted (As required).

MCA -107 Lab of Structured Language (C)

1. Write C program to find largest of three integers.
2. Write C program to check whether the given string or no is palindrome or not.
3. Write C program to find whether the given integer is
   (i) Even or odd
   (ii) A prime number
   (iii) An Armstrong number.
4. Write C program for Pascal triangle.
5. Write C program to find sum and average of n integer using linear array.
6. Write C program to find sum of the digits a given number
7. Write C program to find reverse of a number.
8. Write C program to perform addition, multiplication, transpose on matrices.
9. Write C program to find fibbonacci series of iterative method using user-defined function.
10. Write C program to find factorial of n by recursion using user-defined functions.
11. Write C program to perform following operations by using user defined functions:
    Concatenation, Reverse, String Matching, String length
12. Write C program to find sum of n terms of series:
    n – n*2/2! + n*3/3! - n*4/4! + ...
13. Write C program to interchange two values using
    Call by value.
    Call by reference.
14. Write C program to display the mark sheet of a student using structure.
15. Write C program to perform following operations on data files:
    (i) read from data file.
    (ii) write to data file.
16. Write C program to copy the content of one file to another file using command line argument.
17. And other programs based on the implementation of the concept of arrays , pointers, functions , recursion, pointers, structures, union , command line arguments etc.

MCA - 201 Data Structures and File Organization

Objective: - *Data structure is a subject of primary importance to the discipline of computer science. Through this subject we learn how to organize or structure data i.e. vital to the design and implementation of efficient algorithms and program development.*

Stacks: address calculation in an array, Sparse matrices and vectors, Array and linked list implementation of stacks, Operations on stacks, Application of stack: Conversion of Infix to Prefix and Post fix expressions. Evaluation of Postfix expression using stack.

Queues: Array and linked list implementation of queues. Operations on queue, Circular queue. Introduction to Deque and Priority queue.

Linked List: Single linked list, Doubly linked list, Circular lists.

Trees: Basic terminology ,Array and linked list implementation of binary trees,Traversing binary trees, Operations on binary trees, Threaded Binary trees,Traversing threaded binary trees. Binary search trees.

Sorting and Searching: Insertion sort, Bubble sort, Quick sort, Selection sort, Merge sort, Heap sort, Linear search, Hashing.

File Organization : Physical Storage Media File Organization, Organization of records into Blocks, Sequential file organization, Indexed file organization, Indexed sequential file organization, direct and inverted file organization, multi-list, directory systems, Indexing using B-tree and its variants, Hashing Techniques – Hashing functions, Collision handling methods, Extendible hashing.

Storage Management: First fit, Best fit, Garbage collection, Reference count, fragmentation, compaction.

References

1. Horowitz and Sahani, "**Fundamentals of data Structures**", Galgotia
2. Kruse R., "**Data Structures and Program Design in C**" Pearson Education
3. Tanenbaum A M, "**Data Structures using C & C++**", PHI
4. Lipschutz, "**Data Structure**", TMH
5. Loudon K, "**Mastering Algorithms With C**", Shroff Publisher & Distributors
6. Preiss Bruno R, "**Data Structures and Algorithms with Object Oriented Design Pattern in C++**", Jhon Wiley & Sons, Inc.
7. Drozdek Adam, "**Data Structures and Algorithms in C++**", Thomson Asia
8. Sorenson Pal G., "**An Introduction to Data Structures with Application**", TMH.

MCA - 202 Operating System

Objective: - *Operating System is an essential part of any computer system. A course on Operating System provides a clear description of what Operating System is, what they do and how they are designed and constructed*

Introduction: Definition and types of operating systems, Batch Systems, multi programming, time–sharing parallel, distributed and real-time systems, different view of operating system, Operating system structure, Operating system components and services, System calls Virtual machines.

Process Management and CPU Scheduling: Process concept, Process scheduling, Cooperating processes, Threads, Interprocess communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real-time scheduling and Algorithm evaluation.

Process Synchronization and Deadlocks: The Critical-Section problem, synchronization hardware, Semaphores, Classical problems of synchronization: Reader's Writers problem,Bounded Buffer Problem, Dining Philosopher Problem, Critical regions, Monitors. Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock.

Memory Management: Memory Management-Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation,Segmentation with paging, Virtual Memory, Demand paging and its performance, Page replacement algorithms, Allocation of frames, Thrashing, Page Size and other considerations, Demand segmentation.

File systems and secondary Storage Structure: File concept, access methods, directory implementation, Efficiency and performance, recovery, Disk structure, Disk scheduling methods, Disk management, Swap-Space management.

Protection & Security: Goals of protection, Domain of protection, Access matrix, Implementation of access Matrix, Revocation of Access Rights, language based protection, The Security problem, Authentication, One Time passwords, Program threats, System threats, Threat Monitoring, Encryption.

Case Study: UNIX- History, Design principles, Process Management, Scheduling, Memory management, File Systems, Interprocess communication, security

References

1. Abraham Siberschatz and Peter Baer Galvin, "**Operating System Concepts**", Fifth Edition, Addision-Wesley
2. Milan Milankovic, "**Operating Systems, Concepts and Design**", McGraw-Hill.
3. Harvey M Deital, "**An Introduction to Operating Systems**", Addison Wesley.
4. Tanenbaum A. S. "**Modern Operating System** " PHI.

MCA - 203 Computer Graphics and Multimedia

Objective: - *Computer Graphics is one the most powerful and speedily growing computer field. Computer Graphics has become a common element in user interfaces, data visualization, television commercials, motion picture etc.*

Overview of Computer Graphics and Graphics Hardware: Brief History, Classification of Computer Graphics, Displays Devices: CRT, Storage Tube displays, Plasma Panel, Laser Scan, Beam Penetration and Shadow Mask Color display. Interactive devices and Techniques, calligraphic and Raster displays, joysticks, track balls, mouse and light pens.

Elements of geometry for Graphics: Scan Conversion, Line drawing algorithms: DDA, Bresenhem's algorithm. Character generation, Circle generation: Midpoint circle generation.

2-D/3-D Geometric Transformations and Viewing: Basic Transformations: Scaling, translation and rotation. Reflection and inversion. Implementation using metrices. Window, Viewport, Viewing and Windowing. Line Clipping and Polygon Clipping: Cohen Sutherland, Cyrus-Beck and Sutherland-Hodgman algorithm. 3-D Geometric Transformations: Translation, Rotation and reflection about an arbitrary axis. Clipping and Viewing Transformations. Projection: Orthographic, axonometric and oblique projection, Perspective projection.

Hidden Surfaces and Lines: Back-Face detection, Depth Buffer(Z-Buffer, A-Buffer) method, Scan line Method, Depth sorting method (Painter's algorithm), BSP-Tree Method, Area-Subdivision Method.

Introduction to Multimedia and its Components: Introduction, Needs and areas of use, Multimedia development team & skills, Mac V/s Windows platform for multimedia development, Various stages in multimedia product design. Multimedia Components: Text- plain and formatted text, RTF and HTML text, Fonts editing and design tools. Images- vector and raster graphics, Attributes of images, Image compression techniques (RLE, LZW, JPEG and Wavelet compression). Sound and its attributes, Analog V/s Digital sound, Effects of sound in multimedia. Animation basics, Principle and use of Animation in multimedia. Video- Basics of Video, Analog and Digital Video, Types of video. Multimedia Applications: Video conferencing, Virtual reality, Interactive video, Video on demand.

References:

1. Hearn D and Baker P.M. "**Computer Graphics**" Prentice Hall.
2. Harrington S : "**Computer Graphics: A Programming Approach**", McGraw Hill 1983.
3. Foley J D and Van Dam A, "**Fundamentals of Interactive Computer Graphics**", Addison Wesley.
4. Ralf Steinmetz, Klara steinmetz, "**Multimedia Computing, Communications and Applications**", Pearson education.
5. Tay Vaughan, "**Multimedia : Making it Work**", Tata McGrawHills.
6. Shuman James E., "**Multimedia in Action**", Vikas Publishing House.
7. Rogers D.F. and Adams J.,"**Mathematical Elements of Computer Graphics**", Mc Graw Hill 1985.

MCA- 204 Organizational Behavior and HR

***Objective**: - Organization behavior is a skill & it should be implemented by each employee to make sure that he maintains ethics & values with his colleagues & environment.*

Introduction:- Introduction to Organization and Individuals, What is an organization, components of organization, nature and variety of organizations (in terms of objectives, structure etc.),models of analyzing organizational phenomena, organizational and business variables, organizations in the Indian context institutions and structure basic roles in an organization etc.. Perception attitudes, motives (achievements, power and affiliation), commitment, values creativity and other personality factors, profiles of a manager and an entrepreneur.

Interpersonal and group processes-internal trust, understanding the other person from his/her point of view, interpersonal communication, listening, feedback counseling, transactional analysis, self fulfilling prophecy etc., leadership, motivating people, working as a member of team, team functioning, team decision making, team conflict resolution, team problem solving.

Organizational Structure and Integrating Interpersonal and Group dynamic-Elements of structure, functions of structure, determinant of structure, dysfunctional ties of structure. structure –technology-environment-people relationships, principles underlying design of organizations; organizational culture, organizational politics, issues of power and authority, organizational communications, organizational change ,integrating cases(s)

Case method and lectures should be supplemented with a variety of other methodologies such as feedback on questionnaires and tests, role plays and behaviour simulation exercise.

References

1. Arnold, john, Robertson, Ivan T. and Cooper, Cary, L.,"**Work psychology: Understanding Human Behaviour in the Workplace**", McMillan India Ltd. Delhi.1996

2. Dwivedi, R.S.,"**Human relations and Organization Behaviour: A Global Perspective**", McMillan India Ltd. Delhi.1995

MCA -205 Mathematics II

Objective: - *Interpretation of much of the research in the computer sciences increasingly depends on statistical methods & the s/w engineers are expected to understand & implement statistical quality control techniques in the work place.*

Linear system of equations - Solution of systems of linear equations .Gauss elimination methods - gauss jordan methods, jacobi and gauss seidal iterative methods

Numerical differentiation and integration -Interpolation, differentiation and integration - difference table - newton's forward and backward interpolation - lagrangian interpolation -differentiation formulae- trapezoidal and simpson rule;-gaussian quadrature

Differential equations - Picard's Method, Euler's Method, Taylor's Method,Runge-Kutta methods, Predictor-corrector method, Automatic error monitoring, stability of solution.

Measures of central tendency- A.M, G.M, H.M, Median, Mode, Percentile, Quartile, Measures of Dispersion: Range, Quartile deviation, Mean deviation, Standard deviation, Skewness, Kurtosis. Bivariate Correlation and regression analysis, Curve fitting by method of least square, fitting of a straight line.

Probability- Fundamentals of Probability, Sample space, algebra of events, additive and multiplicative theorems of probability, Conditional probability, Independent events, Baye's formula.

Random variables, Discrete and Continuous probability functions. Special distributions: geometric, Binomial, Poisson, Uniform, exponential, normal.
Sampling methods, simple random sampling, Purposive sampling, stratified random sampling.

Test of significance: Chi square test for goodness of fit of uniformity and independence of attributes, one and two sample t-test.
Forecasting and time series analysis: time series models, methods of moving average, ratio to trend method.

Text Books

1. Grewal B.S, "Numerical methods in Engineering and Science", Khanna Publishers, 1994. (Unit 1,2 & 3)

2. John.E..Freund, Irwin Miller, Marylees Miller "Mathematical Statistics with Applications ", Seventh Edition, Prentice Hall of India, 2004. (Unit 4 & 5)

References

1. A.M.Natarajan & A.Tamilarasi, "Probability Random Processes and Queuing theory", New Age International Publishers, 2nd Edition, 2005.

2. S.K. Gupta, " Numerical Methods for Engineers ", New age International Publishers , 1995.

MCA - 206 OOPS Lab (C++)

Write programs in C++ for

1. Program illustrating use of Inline, Static Member functions, default arguments and Friend function.
2. Programs illustrating overloading of various operators.
3. Program illustrating use of this pointer.
4. Program illustrating use of various types of constructor and destructor.
5. Program illustrating various forms of Inheritance.
6. Program illustrating use of virtual functions, virtual Base Class, Abstract class.
7. Program illustrating how exception handling is done.
8. Program illustrating the use of templates.
9. Program illustrating how exception handling is done.
10. Program illustrating the use of command line argument
11. Program illustrating the use of following file operations on data files:
    read from data file.
    write to data file.
    append
    modify the data.
    Delete the data.
    Display Using text and binary file.

MCA - 207 Data Stucture Lab

Write Program in C or C++ for following:

1. Sparse Matrix
2. Sorting programs: Bubble sort, Merge sort, Insertion sort, Selection sort, and Quick sort.
3. Searching programs: Linear Search, Binary Search.
4. Array implementation of Stack, Queue, Circular Queue, Linked List.
5. Implementation of Stack, Queue, Circular Queue, Linked List using dynamic memory allocation.
6. Implementation of Binary tree.
7. Program for Tree Traversals (preorder, Inorder, postorder).
8. Program for graph traversal (BFS, DFS).
9. Program for minimum cost spanning tree, shortest path.

MCA - 301 Mathematics III

Objective: - *Operation research is applied to a problem that concerns how to conduct & coordinate the operations. Operation research has been applied extensively in diverse areas as manufacturing, transportation, construction, communication etc.*

Linear Programming: Graphical method for two dimensional problems-central problem of linear programming – various definitions – statements of basic theorems and properties, Phase I of Simplex Method, primal and dual – dual simplex methods – sensitivity analysis- transportation problem and its solution-assignment problem and its solution by Hungarian methods.

Integer Programming: Gomory cutting plane methods – Branch and Bound methods.

Queuing Theory: Characteristics of queuing systems-steady state M/M/1 M/M/1/K and M/M/C queuing models.

Replacement Theory: Replacement of items the deteriorate – replacement of items that fail. Group replacement and individual replacement.

Inventory theory: Costs involved in inventory problems-single item deterministic models-economic lot size models without shortages and with shortages having production rate infinite and finite.

PERT and CPM: Arrow networks – time estimates – earliest expected time, latest allowable occurrence time and slack – critical path – probability of meeting scheduled date of completion of project –operation time cost trade off curve-project time cost trade off curve-selection of schedule based on cost analysis, Problems on above topics through TORA & Solver of MS Excel.

References

1. Sharma S.D,., "**Operation Research**".
2. Kapoor V.K,., "**Operation Research**".
3. Gillet,B.E. "**Introduction to operations Research: A computer oriented Algorithmic approach**, "Tata McGraw Hill. NewYork 1990.
4. Gross, D., and Harris, C.N., "**Fundamental of Queuing Theory**", John Wiley and Sons. New York 1980.
5. Hillier, F. and Lieberman, G.J., "**Introduction to operations Research**." Holden Day. New York 1985.
6. Kambo, N.S., "**Mathematical Programming Techniques**", McGraw Hill. New York 1985.
7. Kanti Swarup, Gupta P.K. and Man Mohan,"**Operations Research**". Sultan chand & sons. New Delhi 1990.
8. Mital, K.V., "**Optimization Methods in operations Research and system Analysis**", New Age International (P) ltd, New Delhi, 1992.
9. Shaffer, L.R., Filter J.B., and Neyer W.L., "**The critical Path Method**", McGraw Hill. New York, 1990.

MCA- 302 Computer Networks

Objective: - *This course provides the techniques for inter connection of more than one computer for sharing the information and work*.

Introductory Concepts: Uses of Computer Networks; Network Architecture; Network Characteristics: Size, Performance, Service Paradigms; Reference Models (ISO-OSI, TCP/IP); Network Topologies; Transmission Media; Circuit Switching, Packet Switching; Extending LANs: fiber modems, repeaters, bridges.

The Data Link Layer: Packets, Framing, Error Detection; Data link protocols: stop and wait protocol, sliding window protocol; HDLC; The data link layer in the Internet; The MAC Sublayer: CSMA protocols, IEEE standard 802.2, 802.3, 802.4, 802.5 for LANs and MANs,

The Network Layer: Routing: Routing table, shortest path routing, distance vector routing, link state routing, hierarchical routing; Congestion control: the leaky bucket algorithm, the token bucket algorithm; Internetworking: router gateway, Fragmentation, Internet Protocol (IP), IP Addresses, Internet Control Protocols.

The Transport Layer: Connection management, Transport Control Protocol (TCP), The TCP Segment Format, Three way handshake, TCP Window management.

The Application Layer: Network Security: Cryptography, RSA Algorithm; Domain Name System; Simple Network Management Protocol (SNMP); MIME; POP; HTTP.

Reference:

1. Tanenbaum A.S., "**Computer Networks**", 3rd Ed, PHI, 1999.
2. Comer Douglas E., "**Computer Networks**".
3. Stallings W., "**Computer Communication Networks**", PHI.
4. Michael A. Miller, "**Data & Network Communication**", Vikas Publication.
5. William A. Shay, "**Understanding Data Communication & Networks**", Vikas Publication.

MCA-303 Database Management Systems

Objective: - *Databases & database systems have become an essential component of everyday life in modern society. This course introduces the fundamental concepts necessary for designing, using, & implementing database system & application.*

Basic concepts : Database and Database users, Characteristics of the Database, Advantages and Cost/Risks of Database Management Systems, Database System, Concepts and Architecture, Data Models, Schemas & Database State, DBMS Architecture & Data Independence, Data Base Languages & Interfaces, Data Modeling using the Entity-Relationship Approach.

Relational Model and SQL : Relational Model Constraints, Relational Algebra Operation and Relational Calculus, SQL as a Relational Database Language, Data Definition in SQL, Data Storage in SQL, Views & Queries in SQL, SQL functions, Logical Operators and Relational Algebra Operators in SQL, Specifying constraints & Indexes in SQL, Joining of table and sub queries in SQL, Commit & Checkpoint Instruction, Introduction to PL/SQL, Cursors and Triggers.

Relational Data Base Design : Function Dependencies & Normalization for Relational Databases, Normal forms based on Primary Keys (1NF, 2NF, 3NF & BCNF, 4NF), Loss less join & Dependency preserving decomposition.

Transaction Processing Concepts : Introduction – Single user versus Multi-user System, Transactions, Read and Write Operations and DBMS buffers, Why Concurrency control and Recovery needed, Transactions and system concepts – Transaction states, The system Log, Commit point of a transaction, Desirable properties of a transactions.

Concurrency Control Techniques : Two-phase locking Techniques for concurrency control, Concurrency control based on Timestamp Ordering, Multi-version Concurrency Control Techniques, Validation(Optimistic) concurrency control Techniques, Granularity of Data Items.

Database Recovery Concepts & Techniques : Recovery Outline and Categorization of Recovery Algorithms, Caching of Disk Blocks, Write-Ahead logging, Steal/Bo-steal and Force/No-Force, Checkpoints in the system log and Transaction Rollback, Recovery Techniques Based on Deferred update, Recovery Based on Immediate update, Shadow Paging, Recovery in Multi-databases Systems, Database Backup and Recovery from Catastrophic Failure.

Database Security and Authorizations : Types of Security, Database Security and the DBA, Access protection, User Accounts and Database Audits, Encryption and Public Key Infrastructures – The Data and Advanced Encryption Standards, Public Key Encryption, Digital Signature.

References:

1. Elmsari And Navathe, "**Fundamental of Database Systems**", Addison Wesley, New York.
2. Desai B., "**An Introduction to Database Concepts**" Galgotia Publications, New Delhi.
3. Date, C.J., "**An Introduction to Database Systems**", Narosa Publishing House New Delhi.
4. Ullman. J.D., "**Principles of Database Systems**", Galgotia Publications, New Delhi.

MCA-304 Theory of Computation

Objective: - *This course deals with all aspects of theoretical computer science, namely automata, formal languages, Computability and complexity*

Finite Automata: Deterministic and non Deterministic finite Automata, Properties of transition function, Equivalence of NFA and DFA. Mealy and Moore models, Minimizing the number of states of a DFA' s.

Formal Languages: Definition of a Grammar, Derivations and language generated by a grammar, Chomsky classification of Languages, Languages and their Relation, Operations on Languages.

Regular Languages: Regular Expressions, Transition system containing empty moves, Kleene's Theorem, Arden's Theorem, Algebraic Method using Arden's theorem, Construction of Finite automata equivalent to regular expressions, Equivalence of two Finite Automata, Equivalence of two Regular expressions , Pumping lemma for regular sets Theorem, Application of pumping Lemma and closure properties of regular language.

Context Free Grammar: Derivation Trees, Ambiguity in Context Free grammars**,** Simplification of Context free grammar: Construction of Reduced grammar, Elimination of Null and Unit Productions, Greibach Normal form(GNF) and chomsky Normal Form(CNF), Application of Pumping Lemma for Context free Languages ,

Pushdown Automata: Basic definitions and language accepted by PDA, Non equivalence of PDA and DPDA.

Turing Machines: Turing machine model, Representation of Turing Machines, Design of Turing Machines, Variants of Turing Machine:Multi tape Turing Machine, Non Deterministic Turing Machine,

Linear Bounded Automata(LBA): Model of LBA, Relationship between LBA and context Sensitive languages.

Decidability and Recursively Enumerable languages: DFA,CFG, CSG is Decidable., TM is Undecidable. Halting problem of Turing machine, Application of Post Correspondence Problem

Text Books and References:

1. Hopcroft, Ullman, "**Introduction to Automata Theory, Language and Computation**", Naerosa Publishing House.
2. Mishra K.L.P.and Chandrasekaran N., "**Theory of Computer Science (Automata,Languages and Computation)**", PHI.
3. Martin J. C., "**Introduction to Languages and Theory of Computations**", TMH.
4. Papadimitrou, C. and Lewis, C.L., "**Elements of theory of Computations**", PHI.
5. Cohen D. I. A., "**Introduction to Computer theory**", John Wiley & Sons

MCA - 305 Object Oriented Programming Systems

Objective: - *Every thing under the sky is better visualized is terms of objects. OOPS provide a way of modulating programs by storing data and function form of objects.*

INTRODUCTION TO OBJECT ORIENTED CONCEPTS: Feature of OOP's: Classes, objects, inheritance, reusability, polymorphism, overloading, virtual function.

INTRODUCTION TO C++: DATA TYPES - C++ basic data types, user define data types, derived data types.
CONTROL STATEMENTS: Loops, decision statements.
ARRAY AND STRINGS: Array fundamentals, arrays as instance data, const modifier, strings, string library function, array of strings, structures.

FUNCTIONS : Function definition, stand alone function, overloaded functions, default arguments, Inline, static members, reference arguments, returning by reference.
CONSTRUCTOR : Constructor arguments, one-argument constructor, array as instance data, copy constructors, construction and destruction.
OPERATOR OVERLOADING: Overloading binary and unary operators, conversion from object to basic types, conversion between classes, overloading the =, <<, >>, and [] operators.

INHERITANCE: Introduction to inheritance and types-multi level, multiple, hierarchical, hybrid inheritance, reusability, constructors and inheritance.
POINTER: Address and pointers, pointers and arrays, pointers and strings, Pointers and functions, array of objects, pointers to object, new and delete operators, this pointer.

VIRTUAL FUNCTION AND FRIEND FUNCTION: Introduction to virtual and friend functions, abstract classes and virtual destructors, friend classes, nested classes and static member data.
STREAM AND FILES: Stream classes, stream errors, disk file I/O with stream file pointers and error handling and, file I/O using member functions.
Function Templates, Namespaces.

OBJECT ORIENTED ANALYSIS AND DESIGN:
INTRODUCTION: Introduction to Object Oriented Development.
MODELING CONCEPTS: Object modeling , dynamic modeling, functional modeling.

DESIGN METHODOLOGIES: The OMT methodology, analysis, system design, Object design, Comparison of methodologies.

REFERENCES:

1. Kanetkar Y,"**Let Us C++**", BPB Publication.
2. Lafore Robert,"**Object Oriented Programming in C++**", Techmedia
3. Stroustrup Bjarne,"**The C++ Programming Language**", Addision Wesely.
4. Rumbaugh James and others,"**Object Oriented Modeling and Designing**", PHI

MCA- 306 DBMS Lab

The Queries to be implemented on DBMS by using SQL.

1. Write the queries for Data Definition and Data Manipulation Language.
2. Write SQL queries using Logical operators (=,<,>,etc.).
3. Write SQL queries using SQL operators like (Between… AND, IN(list), like, ISNULL and also with negating expressions).
4. Write SQL query using character, number, date and group functions.
5. Write SQL queries for Relational Algebra Operators Like(UNION, INTERSECT, and MUNUS, etc.).
6. Write SQL queries for extracting data from more than one table (Equi-Join, Non-Equi-Join, etc.).
7. Write SQL queries for through sub queries and nested queries.
8. Write programs by the use of PL/SQL.
9. Create VIEWS, CURSORS and TRIGGRS etc.

NOTE: Students are advised to use Developer 2000 Oracle 8+ version for above experiments. However, depending on the availability of Software's students may use power builder/SQL Server/DB2 etc. for implementation.

MCA -307 Statistical Techniques Lab

Use of any statistical software package.

MCA - 401 Software Engineering

Objective - *Software Engineering defines a systematic approach to the development, operation, maintenance and retirement of software.*

Introduction: Software, Software Engineering, Software Crisis, Software Processes and characteristics of Software Process, Software life cycle models: Waterfall, Prototype, Iterative Enhancement and Spiral models, Overview of Quality Standards like ISO 9001, Introduction to CASE Tools.

Software Metrics: Measure**,** Metrics and Indicators, Software Measurement-size oriented metrics, function oriented metrics, Software Quality Matrics-measuring quality, defect removal efficiency.

Software Project Planning: Project Planning Objective, Software Scope, Available Resources and Cost estimation, Cost estimation by COCOMO Model, Software Risk Management.

Software Requirement Analysis and Specifications: Software Requirements, Problem Analysis – Analysis Issues, Software Requirement Specification (SRS), Characteristics of SRS, Component of SRS, Validation of SRS.

Software Design : Function Oriented Design, Design principles, Module Level concepts- Cohesion and Coupling, Object Oriented Design – Concepts and Design Methodology.

Software Reliability and Testing : Definition and concepts of Software reliability, Software Error, Faults, Repair and availability, Software Testing-process of testing, purpose of testing, Unit Testing, White Box Testing and Black Box Testing, Acceptance and Regression Testing.

Software Maintenance: Management of Maintenance, Maintenance Process, Maintenance Models, Reverse Engineering, Software Re-engineering.

Text & References:

1. Pressman R. S., "**Software Engineering – A practitioner's approach**", 3rd ed., McGraw Hill Int. Ed., 1992.
2. Jalote P., "**An Integrated approach to Software Engineering**", Narosa, 1991.
3. Fairley R., "**Software Engineering Concepts**", Tata McGraw Hill, 1997.
4. Aggarwal K.K. & Singh Yogesh, "**Software Engineering**", New Age International, 2001.
5. Sommerville, "**Software Engineering** ", Addison Wesley, 1999

MCA- 402 Compiler Design

Objective: - *In compiler design emphasis is on solving problems encountered in designing a language translator*

Compiler Structure: Compilers and Translators, Various Phases of Compiler, Pass Structure of Compiler, Bootstrapping of Compiler

Programming Languages: High level languages, The lexical and syntactic structure of a language, Data elements, Data Structure, Operations, Assignments, Program unit, Data Environments, Parameter Transmission.

Lexical Analysis: The role of Lexical Analyzer, A simple approach to the design of Lexical Analyzer, Regular Expressions , Transition Diagrams, Finite state Machines, Implementation of Lexical Analyzer, Lexical Analyzer Generator: LEX, Capabilities of Lexical Analyzer

The Syntactic Specification of Programming Languages: CFG, Derivation and Parse tree, Ambiguity, Capabilities of CFG.
Basic Parsing Techniques: Top-Down parsers with backtracking, Recursive Descent Parsers, Predictive Parsers, Bottom–up Parsers, Shift-Reduce Parsing, Operator Precedence Parsers, LR parsers (SLR, Canonical LR, LALR)
Syntax Analyzer Generator: YACC

Intermediate Code Generation: Different Intermediate forms: three address code, Quadruples & Triples. Syntax Directed translation mechanism and attributed definition.
Translation of Declaration, Assignment, Control flow, Boolean expression, Array References in arithmetic expressions, procedure calls, case statements, postfix translation.

Run Time Memory Management: Static and Dynamic storage allocation, stack based memory allocation schemes, Symbol Table management
Error Detection and Recovery: Lexical phase errors, Syntactic phase errors, Semantic errors.

Code Optimization and Code Generation: Local optimization, Loop optimization, Peephole optimization, Basic blocks and flow graphs, DAG, Data flow analyzer, Machine Model, Order of evaluation, Register allocation and code selection

References:

1. Aho Alfred V., Ullman Jeffrey D., "**Principles of Compiler Design**", Narosa
2. Aho A.V., R. Sethi and Ullman J.D, "**Compiler: principle, Techniques and Tools**", AW
3. Holub H.C. "**Compiler Design in C**", Prentice Hall Inc.

MCA - 403 Design and Analysis of Algorithm

Objective: - *In DAA, we design and analyze algorithms. This course introduces how we specify algorithms and some of the design strategies.*

Introduction-Algorithm, Analysis of algorithm, Design of algorithm and Complexity of algorithm, asymptotic notation, Growth of functions, Summation, Recurrences: The substitution method, The iteration method, The master method, Sorting in Linear and polynomial time, Medians and Order statistics.

Advanced Data Structure: Red Black tree, AVL tree, B-tree, Binomial heap, ordered statistic tree, Disjoint set operations, Linked representation of disjoint sets, and Disjoint set forests.

Advanced Design and Analysis Techniques: Dynamic programming, Greedy algorithm, Back tracking, Branch and Bound.

Graph Algorithms: Elementary graph algorithm, Breadth first search, Depth first search, Minimum Spanning tree, Kruskal's algorithm, Prim's algorithm, Single shortest path, Maximum flow and Traveling Salesman problem.

NP-Completeness Problem: Polynomial-time verification, NP-Completeness and reducibility, NP-Completeness proof, NP-Complete problems.

References

1. Sahani Horowitz, " Fundamentals of Computer Algorithms", Golgotia.
2. Coremen Leiserson etal, " Introduction to Algorithms", PHI.
3 Bratley. Brassard, "Fundamental of Algorithms", PHI.
4. Goodrich M T etal, "Algorithms Design", John Wiley.
5. Aho A V etal, "The Design and analysis of Algorithms", Pearson Education.

MCA-404 & 405 from the Following List of Electives

E- 1 Cryptography And Network Security

Objective: -*This course provides the techniques for sending data over the network without loss of data and without hacking of data.*

Introduction to Cryptography: Introduction To Security: Attacks, Services & Mechanisms, Security, Attacks, Security Services. Conventional Encryption: Classical Techniques, Conventional Encryption Model, and Steganography, Classical Encryption Techniques. Modern Techniques: Simplified DES, Block Cipher Principles, DES Standard, DES Strength, Differential & Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operation.

Conventional Encryption Algorithms: Triples DES, Blowfish, International Data Encryption Algorithm, RCS, CAST-128, RC2 Placement & Encryption Function, Key Distribution, Random Number Generation, Placement Of Encryption Function.

Public Key Encryption: Public-Key Cryptography: Principles of Public-Key Cryptosystems, RSA Algorithm, Key Management, Fermat's & Euler's Theorem, Primality, The Chinese Remainder Theorem.

Hash Functions: Message Authentication & Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Birthday Attacks, Security Of Hash Function & MACS, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA), Digital Signatures: Digital Signatures, Authentication Protocol, Digital Signature Standard (DSS), Proof Of Digital Signature Algorithm.

Network & System Security: Authentication Applications: Kerberos X.509, Directory Authentication Service, Electronic Mail Security, Pretty Good Privacy (PGP), S / Mime, Security: Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, Key Management, Web Security: Secure Socket Layer & Transport Layer Security, Secure Electronic Transaction (Set), System Security: Intruders, Viruses, Firewall Design Principles, Trusted Systems.

Text Book:

1. Stallings William, "**Cryptography and Network Security: Principles and Practice**", Prentice Hall, New Jersey.

Reference Books:

1. Buchmann Johannes A.," **Introduction to cryptography**", Springer-Verlag.
2. Kahate Atul, "**Cryptography and Network Security**", TMH.

E- 2 Client Server Computing

Objective: - *Client Server architecture is the most general architecture of today's applications.In Client Server Computing there is a server program having all the information and processes and all clients access the server to perform any task.*

Client/Server Computing: DBMS concept and architecture, Single system image, Client Server architecture, mainframe-centric client server computing, downsizing and client server computing, preserving mainframe applications investment through porting, client server development tools, advantages of client server computing.

Components of Client/Server application: The client: services, request for services, RPC, windows services, fax, print services, remote boot services, other remote services, Utility Services & Other Services, Dynamic Data Exchange (DDE), Object Linking and Embedding (OLE), Common Object Request Broker Architecture (CORBA).
The server: Detailed server functionality, the network operating system, available platforms, the network operating system, available platform, the server operating system.

Client/Server Network: connectivity, communication interface technology, Interposes communication, wide area network technologies, network topologies (Token Ring, Ethernet, FDDI, CDDI) network management, Client-server system development: Software, Client–Server System Hardware: Network Acquisition, PC-level processing unit, Macintosh, notebooks, pen, UNIX workstation, x-terminals, server hardware.

Data Storage: magnetic disk, magnetic tape, CD-ROM, WORM, Optical disk, mirrored disk, fault tolerance, RAID, RAID-Disk network interface cards.

Network protection devices, Power Protection Devices, UPS, Surge protectors.
Client Server Systems Development: Services and Support, system administration, Availability, Reliability, Serviceability, Software Distribution, Performance, Network management, Help Disk, Remote Systems Management Security, LAN and Network Management issues.

Client/Server System Development: Training, Training advantages of GUI Application, System Administrator training, Database Administrator training, End-user training.
The future of client server Computing Enabling Technologies, The transformational system.

References:

1. Smith Patrick & Guengerich Steave, "**Client** / **Server Computing**", PHI
2. Dewire Dawna Travis, "**Client/Server Computing**", TMH
3. Majumdar & Bhattacharya, "**Database management System**", TMH
4. Korth, Silberchatz, Sudarshan, "**Database Concepts**", McGraw Hill
5. Elmasri, Navathe, S.B, "**Fundamentals of Data Base System**", Addison Wesley

E-3 Advanced Computer Architecture

Objective: - *Offers the advanced techniques of computer architecture such as parallel processing and multiprocessor system etc. which provide a cost effective means to achieve high system performance*

Parallel Computer Model: Elements of modern computers, Evaluation of Computer Architecture, System Attributes to Performance, Shared-memory Multiprocessors, PRAM and VLSI models.

Program and Network Properties: Conditions of parallelism-Data and Resource Dependencies, Hardware and software Parallelism, Program Partitioning and Scheduling- Grain sizes and latency, Grain Packing and scheduling, Static multiprocessor scheduling, Program Flow Mechanisms – Control flow V/s Data flow, Demand Driven Mechanisms, System Interconnect Architectures.

Processors and Memory Hierarchy: Design space of Processors, Instruction-set Architecture, Superscalar Processors, The VLIW Architecture, Hierarchical memory Technology, Inclusion, Coherence and Locality, Virtual Memory Models, Cache Addressing Models, Direct Mapping and Associative Caches, Shared-Memory Organization- Interleaved Memory Organization, Memory allocation Schemes.

Pipelining and Superscalar Techniques: Linear Pipeline Processors, Nonlinear Pipeline Processors, Instruction Pipeline Design, Superscalar Pipeline Design, Super pipelined Design, Multi-computer Message Passing Mechanisms.

Parallel Programming (Software) Models: Shared variable model, Message Passing Model, Data Parallel Model, Object-Oriented Model, Function and logic Model, Parallel Languages and Compilers.

References:

1. Kai Hwang, "**Advanced Computer Architecture: Parallelism, Scalability and Programmability**", McGraw Hill Inc.
2. Hwang Kai & Briggs F.A., "**Computer Architecture and Parallel Processing**", McGraw Hill Inc.
3. Hennessey & Patterson, "**Computer Architecture A Quantitative Approach**", Harcourt Asia, Morgan Kaufmann.

E-4 Mobile Computing

Objective: - *With the huge growth rates in mobile communication & the extension of today's internet application, this syllabus is an introduction to the field of mobile communication & focuses on digital data transfer.*

Issues in Mobile Computing, Wireless Telephony, Digital Cellular Standards, Bluetooth Technology, Wireless Multiple Access Protocols, Channel Allocation in Cellular Systems.

Data Management Issues: Mobility, Wireless Communication and Portability, Data Replication and Replication Schemes, Basic Concept of Multihopping, Adaptive Clustering for Mobile Network, Multicluster Architecture.

Location Management, Location Based Services, Automatically Locating Mobile Uses, Locating and Organizing Services, Issues and Future Directions, Mobile IP, Comparison of TCP and Wireless.

Transaction Management, Data Dissemination, Cache Consistency, Mobile Transaction Processing, Mobile Database Research Directions, Security Fault Tolerance for Mobile N/W.

What is Ad-hoc Network? , Problems with Message Routing in Wireless Ad-hoc Mobile Networks, Routing scheme based on signal strength, Dynamic State Routing (DSR), Route Maintenance and Routing error, Fisheye Routing (FSR), Ad-hoc on Demand Distance Vector (ADDV)

Text Books & References:

1. Upadhyaya Shambhu, Chaudhary Abhijeet, Kwiat Kevin, Weises Mark, "**Mobile Computing**", Kluwer Academic Publishers
2. Hansmann UWE, Merk Lothar, Martin-S-Nickious, Stohe Thomas, "**Principles of Mobile Computing**", Springer International Edition

E- 5 Windows Programming

Objective: - *This course provides the view that how to developed window application using different programming techniques.*

Introduction to windows programming
Windows basic concepts, Win 16 API, Win 32 API, DEF files, Overview and structure of windows programming, coding conventions, Introduction of X - windows, Introduction to resources, Microsoft foundation classes, Documents and views.

Simple applications in windows-Creating windows, , messages handling in windows ,Writing text and Displaying graphics, Font basics.

Mouse and keyboard, designing and creating menus, pop-up menus, Toolbar, Tool tips, Docking toolbars, To generate status bar, Creating Controls: Buttons, List box, Static Control, Combo Box, Edit box and scrollbars.

Dialog box, Property sheets, Slider control, Spin button control, and Image list control, Color Dialog Box.

File I/O: Serialization, write and read records.

Reference:

1. Yashwant Kanetkar, "**Visual C++ Programming**", BPB.
2. Jim Conger," **Windows Programming Primer Plus**", Galgotia.

E-6 Advanced Database Management System

Objective: - *In this course we study advanced concepts of Data Base Management system.*

Extended Relational Model & Object Oriented Database System : New Data Types, User Defined Abstract Data Types, Structured Types, Object Identiy, Containment, Class Hierarchy, Logic Based Data Model, Data Log, Nested Relational Model And Expert Database System.

Query Processing, Optimization & Database Tuning : Algorithms for Executing Query Operations, Estimations of Query Processing Cost, Join Strategies for Parallel Processors, Database Workloads, Tuning Decisions, DBMS Benchmarks, Clustering & Indexing, Multiple Attribute Search Keys, Query Evaluation Plans, Pipelined Evaluations, System Catalogue in RDBMS.

Enhanced Data Models - Client/Server Model, Data Warehousing and Data Mining, Web Databases, Mobile Databases.

Database Design Issues: Security - Integrity - Consistency - Database Tuning - Optimization and Research Issues.

Current Issues: Rules - Knowledge Bases - Active and Deductive Databases - Distributed Databases and Parallel databases.

Text & References :

1. Majumdar & Bhattacharya, "**Database Management System**", TMH.
2. Elmasri and Navathe, "**Fundamentals of Database Systems**", Addison Wesley, 2000.
3. Korth, Silbertz, Sudarshan, "**Database Concepts**", McGraw Hill.
4. Date C j, "**An Introduction to Database System**", Addison Wesley.
5. Hanson Gary W. and Hanson James V., "**Database Management and Design**", Prentice Hall of India Pvt Ltd, 1999.

E-7 Foundation Of E-Commerce

Objective: -*With the advent of electronic communication /media in commercial activities, the study of this course provides the use of telecommunication and data processing technology to improve the quality of transactions between business partners.*

Introduction: Electronic Commerce - Technology and Prospects, Definition of E-Commerce, Economic potential of electronic commerce, Incentives for engaging in electronic commerce, forces behind E-Commerce, Advantages and Disadvantages, Architectural framework, Impact of E-commerce on business.

Network Infrastructure for E- Commerce: Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, FRAME RELAY).

Mobile Commerce: Introduction, Wireless Application Protocol, WAP technology, Mobile Information device, Mobile Computing Applications.

Web Security: Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.

Encryption: Encryption techniques, Symmetric Encryption- Keys and data encryption standard, Triple encryption, Asymmetric encryption- Secret key encryption, public and private pair key encryption, Digital Signatures, Virtual Private Network.

Electronic Payments: Overview, The SET protocol, Payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking.
EDI Application in business, E- Commerce Law, Forms of Agreement, Govt. policies and Agenda.

References

1. Kalakota Ravi, Winston Andrew, "**Frontiers of Electronic Commerce**", Addison Wesley.
2. Bajaj and Nag, "**E-Commerce the cutting edge of Business**", TMH
3. Loshin P., Vacca John, "**Electronic commerce**", Firewall Media, New Delhi

E-8 System Modeling And Simulation

Objective: - *Helpful in learning techniques of architectural and engineering. They are also used for representing economic, financial, organizational, scientific systems. Modeling simulation techniques are used to simulate the behavior of system under various conditions.*

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.

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.

Simulation of continuous systems, analog vs. digital simulation, simulation of water reservoir system, simulation of a servo system, simulation of an autopilot
Discrete system Simulation, Fixed time-step vs. event-to-event model, generation of random numbers, Test for randomness, Generalization of non-uniformly distributed random numbers, Monte-Carlo computation vs. stochastic simulation.

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, world model.

Simulation of PERT networks, Critical path computation, uncertaintities 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, MODSIM-III.

References

1. Gordon Geoftrey,"**System Simulation**", PHI
2. Deo Narsingh, "**System Simulation with digital computer**", PHI
3. Law Averill M., Kelton W. David, "**Simulation Modeling and Analysis**", TMH

MCA - 407 Algorithms Lab

1. Apply the divide and Conquer technique to arrange a set of numbers using merge sort method.
2. Perform Strassen's matrix multiplication using divide and conquer method.
3. Solve the knapsack problem using greedy method.
4. Construct a minimum spanning tree using greedy method.
5. Construct optimal binary search trees using dynamic programming method of problem solving.
6. Find the solution for traveling salesperson problem using dynamic programming approach.
7. Perform graph traversals.
8. Implement the 8 Queens Problem using backtracking.
9. Implement knapsack problem using backtracking.
10. Find the solution of traveling salesperson problem using branch and bound technique.

MCA- 501 Internet and Web Technologies

Internet : Internet, Connecting to Internet: Telephone, Cable, Satellite connection, Choosing an ISP, Introduction to Internet services, E-Mail concepts, Sending and Receiving secure E-Mail, Voice and Video Conferencing.

Web Technologies: Overview of various web technologies and their applications like Java Script, Active Server Pages, Java Server Pages, CGI-Perl, RMI, COM-DCOM, and CORBA.

Java Basics: Features of Java, Data Types, Variables, Operators, Control Statements, Arrays, Classes, Inheritance and Polymorphism, Packages and Interfaces, Exception Handling.

String, StringBuffer, I/O Basics, Streams, Reading from and writing to console and files, Multithreading, The Java Thread Model, Thread Priorities, Synchronization, Interthread Communication.

Java Applets, Networking Basics, Developing TCP/IP client server program, Event Handling, The Delegation Event Model.

Abstract Window Toolkit, Working with Graphics, AWT Controls, Layout managers, Menus, Swings, JDBC basics, Servlets basics, Beans basics.

References:

1. Margaret Levine Young, "**Internet and WWW**", Tata McGraw Hill.
2. Ivan Bayross, "**Web Technologies Part II**", BPB Publications.
3. Naughton, Schildt, "**The Complete Reference Java2**", TMH.
4. Balagurusamy E., "**Programming in Java**", TMH.
5. Keyur shah, "**Gateway to Java Programmer Sun Certification**", TMH
6. Deitel & Deitel, "**Java How to Program**", Prentice Hall.

MCA - 502 Artificial Intelligence

Objective: - *AI is the study of how to make computers do things which, at the moment, people do better. In this course we provide an introduction to the problems and techniques of AI*

Introduction: What is AI, Importance of AI, Early works in AI, Introduction to application areas of AI.

Production systems:
Defining the problem as a state space search: Water Jug Problem; Production systems: Basic Procedure; Production system Characteristics; Control strategies: Kinds of control strategies, Irrevocable: Applying hill climbing to 8 puzzle problem, Tentative: Backtracking: 8 puzzle problem; Specialized Production systems: Commutative production system, Decomposable production system

Search Strategies: Breadth first search, Depth first search, Branch and Bound, Heuristic Search: Traveling Salesman Problem, Best First search, OR Graphs, A* Algorithm, Properties of A* Algorithm, AND Graphs, AO* Algorithm, Means-Ends Analysis.

Games: Grundy's game, Mini max procedure: tic-tac-toe, Alpha Beta procedure: tic-tac-toe.

LISP: Introduction to LISP, Syntax and Numeric Functions, Basic List manipulation functions, Functions, Predicates and conditionals, Input, Output and local variables, property lists and arrays.

Knowledge Representation: General Concepts, Propositional logic, First Order Predicate Logic(FOPL),Rules of Inference, Conversion to Clausal Form, Unification, Resolution: Monkey Banana Problem, Structured Language Representation: Semantic Nets, Frames, Conceptual Dependency, Scripts, Value Inheritance.

Handling Uncertainty: Non monotonic reasoning, Truth maintenance systems, Sources of uncertainty, Probability and Baye's Theorem: Uncertainty using Bayesian Probability.

Learning: Definition and Classification, A paradigm of learning, Classification of learning strategies, Model for machine learning, learning frame work.

Expert System: Definition, Structure, Applications of Expert system.
Neural Network: Neuron Physiology, Artificial Neurons, Artificial neural Network: Hopfield network, Features of artificial neural network.
Genetic Algorithm: Introduction, Procedures of GA, Working of GA, Logic behind GA, A simple GA Algorithm.

References

1. **Rich, E., and Knight, K.,"**Artificial Intelligence**", Addison Wesley Publishing Company, M.A.1992**
2. **Nilsson, N.J., "**Principles of AI**", Narosa Publishing House, 1990.**
3. **Patterson, D.W., "**Introduction to AI and Expert Systems**", Prentice Hall of India, 1992**
4. **Pandhy N.P.,"**Artificial Intelligence and Intelligent Systems**", Oxford, 2006**

MCA-503, 504 & 505 from the Following List of Electives

E-9 Neural Networks

Objective: -*Neural networks are an integral component of soft computing paradigm. The study of neural networks focuses both on the analysis and design of parallel computing systems.*

Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, a-cuts, Properties of a-cuts, Decomposition Theorems, Extension Principle.

Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations.

Introduction: Historical development of Neural Network, Comparison between biological and Artificial Neural Network, ANN Terminologies.

Supervised Learning algorithms:

McCulloch Pitts Neuron Model, Hebb Net, Learning Rules: Hebbian, Perceptron, Delta Learning Rule, Competitive, One Star, Boltzman Memory based Learning.

Perceptron networks: Single Layer Perceptrons and Multi Layer Perceptron Architecture.

Adaline and Madaline Networks: Adaline Architecture, Madaline Architectue:MRI and MRII Algorithm Feed Back Networks: Discrete Hopfield and Continuous Hopfield Nets Feed Forward Networks: Back Propagation Network,Radial basis Network.

Unsupervised learning Algorithms:

Methods used for Determining the Winner, Kohonen Self Organising Feature maps,

Learning Vector Quantization,Max Net,Mexican Hat,Hamming Net.

Full Counter propagation Network,Forward only Counter propagation Network.

Implementation of Neural Network Programs through Matlab.

Text Books/References:

1. Haykin Simon, "**Neural Networks – A Comprehensive Foundation**", Macmillan Publishing Co., New York, 1994.
2. Mahrotra K., Mohan C.K. and Ranka Sanjay, "**Elements of Artificial Neural Networks**", MIT Press, 1997 – Indian Reprint Penram International Publishing (India), 1997
3. CichockA. i and Unbehauen R., "**Neural Networks for optimization and Signal processing**", John Wiley and Sons, 1993.
4. Zurada J.M., "**Introduction to Artificial Neural networks**", (Indian edition) Jaico Publishers, Mumbai, 1997.
5. Fu Limin. "**Neural Networks in Computer Intelligence**", TMH.

E-10 Data Mining and Warehousing

Objective:-*Data mining represent the latest trend in computing environment & information technology application to large scale processing & analysis of data.*

Data Warehousing: Definition, Scope, Practical Implications, Structures and functions.

Data Mining: Process, Technologies & Rules, platform tools & tool characteristics, operational vs. information systems.

Types of Data Warehouses: Host based, single stage, LAN based, Multistage, stationary distributed & virtual data-warehouses.

Data warehouses architecture: Metadata, operational data & operational data bases. Data warehouse architecture model, 2-tier, 3-tier & 4-tier data warehouses.

OLAP & DSS support in data warehouses.

Data Mining: Knowledge discovery through statistical techniques, Knowledge discovery through neural networks, Fuzzy tech. & genetic algorithms.

Multimedia Data Mining, Multimedia Databases, Mining Multimedia Data, Data-Mining and the World Wide Web, Mining and Meta-Data, Data Visualization.

Text & References :

1. Inmon W.H., "**Building the Data Warehouse**", John Wiley & Sons.
2. Inmon W.H., Kelly C., "**Developing the Data Warehouse**", John Wiley & Sons.
3. Inmon W.H., Gassey C.L. "**Managing the Data Warehouse**", John Wiley & Sons.
4. Fayyad, Usama M. etal. "**Advances in knowledge discovery & Data Mining**", ,MIT Press.
5. Berson, "**Data Warehousing, Data-Mining & OLAP",** TMH.
6. Mallach, "**Decision Support and Data Warehousing System",** TMH.

E-11 Virtual Reality

Objective:-Virtual reality *(**VR**) is a technology which allows a user to interact with a computer simulated environment, whether that environment is a simulation of the real world or an imaginary world.*

Introduction to the Course. What is Virtual Reality? Sensing in VR and VR Hardware. VR Development Languages. VR past, present, and future. Examples of Virtual Worlds. Development issues - Development cycle and development tools. Organizing the code. Scenes and scene graphs. Creating and navigating the virtual world. Gravity and collision. Geometry, standard units, co-ordinate systems and transformations. Examples.
Adding user interaction - Events and time, sensors and routes. Examples. Object oriented nature of VRML programming - Prototypes, nodes, fields. Structure of a VR Object. Creating Prototypes and Objects. Interface declaration semantics. Definition semantics. Rules for mapping. Scoping rules. External prototype semantics. Static and dynamic instantiation. Examples.
Adding processing capabilities to VR models - Scripting. Script languages. Script execution. Initialize and shutdown. Events processed. Scripts with direct outputs. Asynchronous scripts. Event In handling. Accessing fields and events. Accessing fields and event Outs of the script. Accessing evenings and event Guts of other VRML nodes. Sending event Outs. Examples.
Adding audio-visual effects 1 - Animation and Light. Interpolators. Common principles. Color interpolator. Scalar Interpolator. Orientation Interpolator, Position Interpolator. Dynamic scaling. Directional, point, and spot light. Examples. .
Adding audio-visual effects 2 - Texture and Sound. Textures and texture maps. Application of textures to different geometric objects. Level of Detail. Sound and its spatial aspect. Examples. Creating VR models with emergent behavior. Examples. . Using Java with VRML, - Scripting in Java. Creating and driving a virtual world from an external Java code - External Authoring Interface. Examples.

References:

1. Carey R., Bell G. "The **Annotated VRML 2.0 Reference**" Addison Wesley, 1997.
2. McCarthy M., Descartes A. "**Reality Architecture: Building 3D Worlds In Java and VRML**" Prentice Hall, 1998.
3. Diehl S. "**Distributed Virtual Worlds: Foundations and Implementation Techniques Using VRML, Java, and CORBA**.", Springer Verlag, 2001.

E – 12 Digital Image Processing

Objective:-*This course is helpful in learning techniques of improving the quality of picture and, rearranging picture parts. These techniques are extensively used is commercial application.*

Digital Image Fundamentals: Elements of Visual Perception: Structure of Human Eye, Image Formation in the eye, Brightness, Adaptation and Discrimination, Light and lectromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationship Between Pixels: Neighborhood of a Pixel, Adjacency, Connectivity, Regions and Boundaries, Distance Measures, Image operation on a pixel basis.

Image Enhancement in the Spatial Domain: Some Basic Gray level Transformations: Image Negatives, Log Transformations, Power Law Transformations, Piecewise Linear Transformation Functions. Histogram Processing: Histogram Equalization, Histogram Matching, Local Enhancement, Use of Histogram Statistics for Image Enhancement. Enhancement using Arithmetic/Logical Operations: Image Subtraction and Image Averaging. Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial filters.

Image Enhancement in the Frequency Domain: Introduction to the Fourier Transform and Frequency Domain, Smoothing Frequency Domain Filters, Sharpening Frequency Domain Filters, Homomorphic Filtering.

Image Compression: Image compression Models, Elements of Information Theory, Lossy Compression.

Image Segmentation: Detection of Discontinuities: Point Detection, Line Detection, Edge Detection, Edge Linking and Boundary Detection: Local Processing, Global Processing via Hough Transform, Threshold, Region based Segmentation.

Object Recognition: Patterns and Pattern Classes, Recognition Based on Decision Theoretic Models

References:

1. Gonzalez and Wood,"**Digital Image Processing**", Addison Wesley, 1993.
2. Rosenfeld and Kak, "**Digital Picture Processing Vol. I & Vol. II**", Academic, 1982.
3. How. "**Digital Document Processing**", Wiley Interscience, 1983.
   Ballard and Brown "Computer Vision", Prentice Hall, 1982.
4. Pavlidis.,"**Algorithm for graphics and Image Processing**", Computer Sc. Press, 1982.
5. Niblack Wayne "**An Introduction to Digital Image Processing**", Prentice Hall, 1986.
6. Sonka Milan, Hlavac Vaclav, Boyle Roger, "**Image Processing, Analysis and Machine Vision**", Vikas Publications.

E -13 Embedded Systems

Objective :- *An* ***embedded system*** *is a special-purpose computer system designed to perform one or a few dedicated functions, often with real time computing constraints. It is usually embedded as part of a complete device including hardware and mechanical parts.*

Introduction to embedded Systems: Classification, Characteristics and requirements.
Timings and Clocks in Embedded Systems: Task Modeling and management. Real- Time operating System issues.
Signals: frequency spectrum, and sampling, digitization (ADC, DAC), signal conditioning and processing. Modeling and characterization of embedded computing systems.
Embedded Control and Control Hierarchy. Communication strategies for embedded systems: encoding, and flow control.
Fault Tolerance Formal Verification

References:

1.Kopetz H., "**Real-Time Systems**", Kluwer, 1997
2.Gupta R., "**Co-synthesis of Hardware and Software for Embedded Systems**", Kluwer 1995.

E-14 Real Time System

Objective:-*Real Time computing (RTC) is the study of hardware and software systems that are subject to a "real-time constraint"—i.e., operational deadlines from event to system response.*

Introduction to Real Time Systems, Priorities, Embedded Systems, Task, Classification & Requirements, Deadlines, Soft, Hard.

Firm Real Time Systems, Introduction to Real Time Operating Systems, Task Management, Inter Process Communication, Case Studies of Maruti II, HART OS, VRTX etc.

Characterizing Real Time Systems and Task, Task Assignment & Scheduling Theory, Fixed and Dynamic Priority Scheduling
Uniprocessor (RM and EDF), Multiprocessor (Utilization Balancing, Next-fit for RM & Bin-Packing Assignment for EDF) Scheduling

Programming Languages and Tools, Real Time Databases
Real Time Communication, FDDI, Specification and Verification using Duration Calculus, Flow Control, Protocols for Real Time (VTCSMA, Window, IEEE 802.3, IEEE 802.4, IEEE 802.5, Stop and Go Protocol, Media Access Protocol),

Fault, Fault Classes, Fault Tolerant Real Time System, Clocks, Clock Synchronization, Issues in Real Time Software Design.

References

1. Krishna, C.M, "**Real Time Systems**", McGraw Hill
2. Jane W.S. Liu, "**Real Time Systems**", Pearson Education Asia
3. Levi and Agarwal, "**Real Time Systems**", McGraw Hill
4. Mathi & Joseph, "**Real Time System: Specification, Validation & Analysis**", PHI

E-15 Bio Informatics

Objective:*-Bioinformatics is the combination of biology and computer science and is a new emerging field that helps in collecting, linking, and manipulating different types of biological information to discover new biological insight.*

What is bio informatics, And why study it? How is large-scale molecular biology data generated, Where how can researchers gain access to it, and what is quality of data generated, where how can researchers gain access to it, And what is the quality of the data? Private and future data sources. Metadata : Summary and reference systems, Finding new types of data online, Likely growth areas.

Biological Bases for Bio informatics - The diversity of life forms - The unifying theme

Information storage - nucleic acids,-Information expression-Proteins and Biochemical reaction chains. - Nucleic acid - Structure,-Replication,-Transcription, Translation Unit-III - Proteins-Structure, Folding and function - Nucleic acid protein interactions

Nucleotides Sequence Data: Genome, Genomic sequencing, Expressed sequence tags, Gene expression, Transcription factor binding sites and single nucleotide polymorphisms. Computational representations of molecular biological data storage techniques: Databases (flat; relational and Object oriented), And controlled vocabularies. Also, General data retrieval techniques: indices, Boolean search, fuzzy search and neighboring, Application to biological data warehouses.

Biological data types and their special requirements: sequences, Macromolecular structures, Chemical compounds generic variability, And connections to clinical data. Representation of patterns and relationships: alignments, Regular expressions, Hierarchies, And graphical models.

References:

1. O'Reilly, "**Developing Bio informatics computer Skill**",Ist Indian Edition's publication.
2. Griffiths J.F.,"**An Intro. To Generic Analyis-Anthony**" et al. 1st Ed.
3. Starkey Michal and Elaswarapu Ramnath, "**Genomic Protocols**".
4. Misner Stephen & Krawetz Stephen, "**Bioinformatics-Methods and Protocols**".
5. Hunter Lawrence "**'ArtificialIntelligence & molecular Biology**", Free on web
6. "**DNA & Protein Sequence Analysis-A Practical Approach**", IRL Press at OX UniversityPress.
7 Heggins. Des willie Taylor "**Bioinformatics : Sequence, Structure & Databases: A practical Approach**".
8. "**Bio-Informatics**", Addison Wesley.

E-16 Software Reliability Engineering

Objective:- *The importance of reliability engineering is to develop the reliability requirements for the product, establish an adequate reliability program, and perform appropriate analyses and tasks to ensure the product will meet its requirements.*

Introduction to software reliability

Software reliability definitions - software disasters - errors - faults - failures – different views of software reliability – software requirements specification - causes of unreliability in software - dependable systems: reliable, safe, secure, maintainable, and available - software maintenance.

Software reliability improvement

The phases of a software project - monitoring the development process – the software life cycle models - software engineering - structured analysis and structured design - fault tolerance - inspection - software cost and schedule.

Software quality management

Software quality modeling - diverse approaches and sources of information – fault avoidance, removal and tolerance - process maturity levels (cmm) - software quality assurance (sqa) - monitoring the quality of software - total quality management (tqa) - measuring software reliability - the statistical approach - software reliability metrics.

Software reliability techniques and tools

Data trends - complete prediction systems - overview of some software reliability models - the recalibration of the models - analysis of model accuracy – reliability growth models and trend analysis - software costs models - super models.

Software reliability engineering practice

Testing and maintaining more reliable software –logical testing – functional testing –algorithm testing – regression testing - fault tree analysis – failure mode effects and critical analysis – reusability - case studies.

REFERENCES

1. Michael.R.Lyu, Handbook of Software Reliability Engineering, 2nd edition, 2004.
2. J.D. Musa, A. Iannino and K.Okumoto, Software Reliability, Measurement, Prediction,
Application, McGraw Hill, 2000.
3. J.D. Musa, Software Reliability Engineering, McGraw Hill, 2000.

MCA - 507 WebTechnologies Lab

1. Program to illustrate the use of overloading and overriding.
2. Program to implement the concept of Interfaces and packages.
3. Generate the program using exceptions handling mechanism.
4. Implement the file operations.
5. Implement the concept of multithreading
6. Program using Applets.
7. Program using JDBC.
8. Developing TCP/IP client server program.

The students should be motivated to develop a mini online project in Java (either on LAN or internet)