(3)

Master of Computer Applications

(MCA)

CBCS – Syllabus and Ordinance

(2015 - 2016)

Department of Computer Science,
University of Lucknow,Lucknow

(4)

Syllabus

Master of Computer Applications (MCA)

(2015-16)

Annexure - I

MCA (Master of Computer Applications)

MCA-I Semester

Subject Code	Subjects	Periods per Week			Total Credits
		L	T	P	
MCA101	IT & Computer Fundamentals	4	---	---	4
MCA102	Digital Logic & Organization	4	---	---	4
MCA103	Programming-Using 'C' Language	4	---	---	4
MCA104	Computer Programming and Problem Solving , Principles	4	---	---	4
-	**Elective - I**	3	---	---	3
MCA105P	Practical Lab-I (Digital Logic and Programming Using C Language)	---	---	8	4
	Total	19		8	23

Elective-I (Subjects)

MCA1-E1	Principles of Management
MCA1-E2	Discrete Mathematics and its Applications
MCA1-E3	System Analysis & Design

MCA-II Semester

Subject Code	Subjects	Periods per Week			Total Credits
		L	T	P	
MCA201	Computer Organization and Architecture	4	---	---	4
MCA202	Programming in Visual Basic	4		---	4
MCA203	Data Structure and Algorithms Using 'C' Language	4	---	---	4
MCA204	Computational Numerical Methods	4	---	---	4
	Elective- II	3	---	---	3
MCA205P	Programming Lab-II (Visual Basic and Data Structure and Algorithms Using 'C' Language)	---	---	8	4
	Total	19	---	8	23

Elective-II (Subjects)

MCA2-E1	Assembly Language Programming and Microprocessor
MCA2-E2	Accounting and Financial Management with Tally
MCA2-E3	Software Quality Controls

I Semester

	Subjects	Periods per Week			Total Credits
		L	T	P	
[illegible]1	Relational Database Management System (Oracle- xi)	4	---	---	4
[illegible]302	Theory of Computation	4	---	---	4
MCA303	Object Oriented Programming Concepts Using C++	4	---	---	4
MCA304	Computer Network	4	---	---	4
	Elective – III	3	---	---	3
MCA305P	Practical Lab-III (RDBMS and OOPs Using C++)	---	---	8	4
	Total	19	---	8	23

Elective-III (Subjects)

MCA3-E1	Operating System
MCA3-E2	Management Information System
MCA3-E3	Reliability Engineering

MCA-IV Semester

Subject Code	Subjects	Periods per Week			Total Credits
		L	T	P	
MCA401	Design and Analysis of Algorithms	4	---	---	4
MCA402	Software Engineering Concepts	4	---	---	4
MCA403	Data Warehousing & Data Mining	4	---	---	4
MCA404	Java and J2EE	4	---	---	4
	Elective- IV	3	---	---	3
MCA405P	Programming Lab-IV (Java and J2EE)	---	---	8	4
	Total	19	---	8	23

Elective-IV (Subjects)

MCA4-E1	Artificial Intelligence
MCA4-E2	Advanced Web Designing Technologies
MCA4-E3	Cloud Computing

MCA-V Semester

Subject Code	Subjects	Periods per Week			Total Credits
		L	T	P	
MCA501	Computer Graphics	4	---	---	4
MCA502	Multimedia and Virtual Reality	4	---	---	4
MCA503	Compiler Design	4	---	---	4
MCA504	Network Security	4	---	---	4
	Elective – V	3	---	---	3
MCA505	Minor Project	---	---	8	4
	Total	19	---	8	23

Elective-V (Subjects)

MCA5-E1	Neural Networks
MCA5-E2	Programming in VC++
MCA5-E3	Software Project Management

MCA-VI Semester

Subject Code	Subjects	Periods per Week			Total Credits
		L	T	P	
MCA601	Final Dissertation (Major Project)	---	----	30	15
MCA602	Seminar/ Presentation (Major Project)	---	---	8	8
	Total	---	---	38	23

Total Credits = 138, 1Cerdit =12 hours, Each Subject= 4 Credits, 2Practical hours= 1 Credit, 1Elective Subject= 3 Credit

Department of Computer Science, University of Lucknow

Marks Distribution

MCA-I Semester

Subject Code	Subjects	Internal	Theory	Total
MCA101	IT & Computer Fundamentals	30	70	100
MCA102	Digital Logic & Organization	30	70	100
MCA103	Programming-Using 'C' Language	30	70	100
MCA104	Principles of Management	30	70	100
	Elective - I	30	70	100
MCA105P	Practical Lab-I (Digital Logic and Programming Using C Language)	----	----	100
	Total	150	350	600

Elective-I (Subjects)

MCA1-E1	Principles of Management
MCA1-E2	Discrete Mathematics and its Applications
MCA1-E3	System Analysis & Design

MCA-II Semester

Subject Code	Subjects	Internal	Theory	Total
MCA201	Computer Organization and Architecture	30	70	100
MCA202	Programming in Visual Basic	30	70	100
MCA203	Data Structure and Algorithms Using 'C' Language	30	70	100
MCA204	Computational Numerical Methods	30	70	100
	Elective- II	30	70	100
MCA205P	Programming Lab-II (Visual Basic and Data Structure and Algorithms Using 'C' Language)	----	----	100
	Total	150	350	600

Elective-II (Subjects)

MCA2-E1	Assembly Language Programming and Microprocessor
MCA2-E2	Accounting and Financial Management with Tally
MCA2-E3	Software Quality Controls

MCA-III Semester

Subject Code	Subjects	Internal	Theory	Total
MCA301	Relational Database Management System (Oracle- xi)	30	70	100
MCA302	Theory of Computation	30	70	100
MCA303	Object Oriented Programming Concepts Using C++	30	70	100
MCA304	Compu er Network	30	70	100
	Elective - III	30	70	100
MCA305P	Practical Lab-III (RDBMS and OOPs Using C++)	----	----	100
	Total	150	350	600

Elective-III (Subjects)

MCA3-E1	Operating System
MCA3-E2	Management Information System
MCA3-E3	Reliability Engineering

MCA-IV Semester

Subject Code	Subjects	Internal	Theory	Total
MCA401	Design and Analysis of Algorithms	30	70	100
MCA402	Software Engineering Concepts	30	70	100
MCA403	Data Warehousing & Data Mining	30	70	100
MCA404	Java and J2EE	30	70	100
	Elective- IV	30	70	100
MCA405P	Programming Lab-IV (Java and J2EE)	----	----	100
	Total	150	350	600

Elective-IV (Subjects)

MCA4-E1	Artificial Intelligence
MCA4-E2	Advanced Web Designing Technologies
MCA4-E3	Cloud Computing

MCA- V Semester

Subject Code	Subjects	Internal	Theory	Total
MCA501	Computer Graphics	30	70	100
MCA502	Multimedia and Virtual Reality	30	70	100
MCA503	Compiler Design	30	70	100
MCA504	Network Security	30	70	100
	Elective - V	30	70	100
MCA505	Minor Project	----	----	100
	Total	150	350	600

Elective-V (Subjects)

MCA5-E1	Neural Networks
MCA5-E2	Programming in VC++
MCA5-E3	Software Project Management

MCA-VI Semester

Subject Code	Subjects	Marks
MCA601	Final Dissertation (Major Project)	400
MCA602	Seminar/ Presentation (Major Project)	200
	Total	600

Department of Computer Science, University of Lucknow

DETAILED SYLLABUS OF MCA (Master of Computer Application)

MCA-I Semester

MCA101- IT AND COMPUTER FUNDAMENTALS

UNIT–I

Computer system concept, computer system characteristics, capabilities and limitations, types of computers – analog, digital, hybrid, general, special purpose, micro, mini, mainframe, super. Generations of computers, personal computer (PC) - IBM PC, characteristics, PC/PCXT/PCAT- configurations, Pentium and newer PC specifications and main characteristics. Types of PC-desktop, laptop, notebook, palmtop, workstations etc, their characteristics, add on cards on PC : sound card, video card, network card etc. Basic components of a Computer System - Control Unit, ALU, Input /Output functions and Characteristics, Memory – RAM, ROM, EPROM, PROM and other types of memory.

UNIT–II

Input devices-Keyboard, Mouse, Trackball, Joystick, Digitizing Tablet, Scanners, Digital Camera, MICR, OCR, OMR, Bar-code Reader, Voice Recognition, Light Pen, Touch Screen – Working Principles, Areas of use & characteristics. Output Devices – Monitors, Characteristics and Types of Monitor –Digital, Analog, Size, Resolution, Refresh Rate, Interlaced / Non Interlaced, Dot Pitch, Video Standard – VGA, SVGA, XGA etc. Printers - Daisy Wheel, Dot Matrix, Inkjet, Laser, Line Printer, Plotter Storage Devices –Fundamentals, Primary Vs Secondary, Data Storage and Retrieval Methods - Sequential, Direct and Index Sequential, Various storage devices - Magnetic Tape, Magnetic Disks, Cartridge Tape, Hard Disk Drives, Floppy Disks(Winchester Disk), Optical Disks, CD, VCD, CD-R, CD-RW, Zip Drive.

UNIT–III

Need, Types of Software - System Software, Application Software, System Software - Operating System, Utility Program, Programming Languages, Assemblers, Compilers and Interpreter, Operating Systems - Functions, Types - Batch, Single, Multiprogramming, Multiprocessing, Programming Languages- Machine, Assembly, High Level, 4GLs, Their merits and demerits, Application Software – Word Processing, Spreadsheet, Presentation Graphics, Data Base Management Software, Characteristics, Uses and examples and area of applications of each of them.Virus, Types of Viruses, Virus detection and prevention Viruses on Network. Introduction to Multimedia.

UNIT–IV

Data communication and networks, Types of Network – LAN, WAN, MAN, Networks Models – Client Server, Peer - to - Peer, Intranet, Internet. Topologies of LAN - Ring, Bus, Star, Mesh and Tree Topologies, Components of LAN – Cable & Wireless Media, Network Interface Card Hub, Routers, Repeater . Communication Protocols. Analog and Digital Signals. Modem - Working and characteristics, Types of connections - Dialup, Leased Lines, ISDN, Programming Techniques Various Stages in Program development. Algorithms, Flow Charts - Symbols, Rules for Making Flow Chart, Types of Flow-Chart, Advantage & disadvantage, Pseudo codes, Programming Techniques – Top Down, Bottom up, Modular, Structured - Features, Merits & demerits, Comparative study. Programming Logic- Simple, Branching, Looping, Recursion.

TEXT & REFERENCE BOOKS:

- **COMPUTERS TODAY** BY S.K.BASANDRA, GALGOTIA PUBLICATIONS.
- **FUNDAMENTALS OF INFORMATION TECHNOLOGY** BY ALEXIS LEON & MATHEWS LEON, VIKAS PUBLISHING HOUSE, NEW DELHI.

UNIT-I

Data representation Data Types and Number Systems, Binary Number System, Octal & Hexa-Decimal Number System, Fixed Point Representation, 1's & 2's Complement, Binary Fixed- Point Representation, Arithmetic Operation on Binary Numbers, Overflow & Underflow, Floating Point Representation, Codes, ASCII, EBCDIC Codes, Gray Code, Excess-3 & BCD, Error Detection & Correcting Codes Binary Storage and Registers.

UNIT–II

Boolean algebra and digital logic circuits -Logic Gates, AND, OR, NOT Gates and their Truth Tables, NOR, NAND & XOR Gates, Boolean Algebra, Basic Definition and Properties, Basic Boolean Law's, Demorgan's Theorem Map Simplification, Minimization Techniques, K Map – Two, Three and More variables maps, Sum of Product & Product of Sums, Don't care conditions, Combination & Sequential Circuits, Half adder & Full adder, Full subtractor, Full subtractor and decimal adder, Code Conversion, Multilevel NAND and NOR Circuits, Multiplexers and Demultiplexers, RAM and ROM Working & Circuit

UNIT–III

Sequential logic- Flip-Flops - RS, D, JK & T Flip-Flop, Triggering in flip flops, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, flip flop excitation tables, Design procedure and design of counters. Design with equations, Registers, Counters and the memory unit, Shift registers, Ripple counters and Synchronous counters, Timings sequence digital logic families.

UNIT–IV

Registers transfer logic, Intel Register Transfer, Arithmetic Logic and Shift Micro Operation, Conditional, Constant Statement, Fixed Point Binary Data Floating Point Data, Instruction Codes. Input-

output organizations- I/O Interface, Properties of simple I/O Devices and their controller, Isolated Vs Memory-mapped I/O, Modes of data transfer, Synchronous & Asynchronous data transfer, Memory organization - Auxiliary Memory, Magnetic Drum, Disk & Tape, Semi-conductor memories, memory, Hierarchy, Associative memory, Virtual memory, Address space & memory space, Address mapping, page table, Page replacement, segmentation, Cache memory, Hit ratio, Mapping techniques, Writing into cache.

TEXT & REFERENCE BOOKS:

- **COMPUTER SYSTEM ARCHITECTURE BY MORRIS MANO.**
- **DIGITAL LOGIC AND COMPUTER DESIGN BY MORRIS MANO.**

UNIT–I

Overview of C, Feature of C, Structure of program, Variables, Expression, Identifiers, Keywords, Data types, Constants, Operator: Arithmetic, Logical, Relational, Conditional and Bitwise operators, Precedence and associatively of operators, Types conversion in expression Basic input/output and library functions Single Character Input/Output i.e. getch(), getchar(), getche(), putchar(), Formatted input/output i.e. printf() And scanf(), Library Functions – concepts mathematical and character functions. Control structures- If Statement, If.....Else Statement, Nesting Of If.....Else Statement, Else If Ladder, ? : Operator, Switch Statement, Compound Statement, Loop Controls – For, While, Do-While Loops, Break Continue, Exit, Goto Statement .

UNIT–II

The Need of a Function, User Defined and Library Function, Prototype of a Function, Function Argument, Return Values and Nesting of Function, main(),Command Line Argument, Recursion, Calling of Functions, Array as Function Argument, Scope and Life of Variables - Local and Global Variable, Storage Class specifier – Auto, Extern, Static, Register, Preprocessor Directive, Arrays-Single And Multidimensional Arrays, Array Declaration And Initialization Of Arrays, String : Declaration, Initialization, String Functions

UNIT–III

Structure and union-Defining Structure, Declaration Of Structure Variable, Accessing Structure Members, Nested Structures, Array Of Structures, Structure Assignment , Structure As Function Argument, Function That Return Structure, Union, Pointers- The & And * Operators, Pointers expressions, Pointers V/s Arrays, Pointer to functions, Functioning returning pointers.Dynamic memory allocation Introduction, Malloc, Calloc, Sizeof, Free, Realloc Functions Bitwise operator

UNIT–IV

File management-Defining, Opening a File & Closing a File, Text file, Binary file, Functions for File Handling: fopen, fclose, gets, puts, fprint, fscanf, getw, putw, fputs, fgets,fread, fwrite, Random access to files : fseek, ftell, rewind, file name as Command Line Argument.Graphics on your PC, Initialize Graphics Mode, Functions used In Graphics - Drawing a Point on The Screen, Drawing – lines, rectangle, ovals, circles, arcs, polygon, filling colors, Using Text in Graphics Display.

TEXTS & REFERENCE BOOKS:

- **PROGRAMMING IN C** BY E. BALAGURUSWAMI, TMH PUBLICATIONS
- **PROGRAMMING WITH C** BY GOTTFRIED, SCHAUMS OUTLIE SERIES, TMH PUBLICATIONS
- **THINKING IN C** BY MAHAPATRA, PHI PUBLICATIONS
- **GRAPHICS PROGRAMMING IN C** BY STEVENS, BPB PUBLICATION
- **PROGRAMMING IN C** BY R SUBBURAJ, VIKAS PUBLISHING

MCA104- Computer Programming and Problem Solving Principles

UNIT-I

Criteria for the design of a good programming language, Defining Syntax - The character Set, BNF, Syntax Graphs, Syntax and Program Reliability Variables, Expressions and statements - Variables and the Assignment statements, Binding time & the Storage Allocation, Constants and Initialization, Expressions, Conditional statements, Iterative Statements, The GOTO Statements and Labels.

UNIT-II

Data types and Typing, Enumerated Data types, Elementary Data types, Type Coercion, Type Equivalence, Binding Scope and Extent Revisited.

Procedures - General Features, Parameter Evaluation and Passing, Call-by-name, Call by value, Call by reference, Call by text, Specifications of Objects in a Procedure, Aliasing, overloading, Generic Functions, overloading, Generic Functions, Co-routine, Data Abstraction.

UNIT-III

Concurrency - Basic Concepts, Monitors, Message Passing, Concepts of Input - output. Functional Programming - The Basics of LISP, The LIST Interpreter, FUNARGs and FEXPRs, the PROG Features, Data Flow, Programming Languages, The Data Flow Model, and Language Design Goals.

UNIT-IV

Object Oriented Programming Language – Object Oriented Programming Concepts, Object Oriented Programming Compared to Traditional Programming Objects, Messages, Methods and Classes. Control Structures, Classes Compared to Abstract Data Type, Inheritance and Polymorphism.

TEXT & REFERENCE BOOKS:

- FUNDAMENTAL OF PROGRAMMING LANGUAGE BY ELLIS HOROWITZ GALGOTIA PUBLICATION
- **PROGRAMMING LANGUAGES** BY ALLEN B.TUCKER, TMH PUBLICATION
- **PROGRAMMING DESIGN** BY PETER JULIFF (4TH EDITION)
- **CONCEPTS OF PROGRAMMING LANGUAGES** BY ROBERT W. SEBESTA : LOW PRICED EDITION(4TH EDITION)

MCA105P	Practical Lab-I (Digital Logic and Programming Using C Language)

Elective-I (Subjects)

MCA1-E1 Principles of Management

UNIT–I

Management practices- Meaning and Functions, Development of Management Thought, F. W. Taylor And Herry Fayol's Theories of Management, Qualities of an Efficient Management, Management Principles Of Modern Times (Empowerment, Kaizen, Quality Circles, Total Quality Management.

UNIT–II

Planning -Plan, policies, strategies and programs, steps in planning & decision making, forecasting , qualities of an effective planner, relevant case study, Organizing-Organizational Design, Organizational Structure, Centralization & Decentralization, Delegation, Gantt chart and PERT/CPM, Relevant Case Study

UNIT–III

Directing-Motivation and team building, theories of motivation, factors affecting motivation. Leadership, leadership styles, theories of leadership, qualities of a effective leader, effective communication and presentation skills, relevant case studies.

UNIT-IV

Controlling Meaning and basic principles, types of controls, budget and budgetary control, inventory control and quality control, relevant case studies.

TEXTS & REFERENCE BOOKS:

- ESSENTIALS OF MANAGEMENT BY H. KOONZ & H. WEIHRICH TMH PUBLICATION
- PRINCIPLES OF MANAGEMENT BY O.P. KHANNA

MCA I – E2 Discrete Mathematics and its Applications

UNIT- I

Sets & preposition - Introduction, combinations of sets, finite and infinite sets, unacceptable indefinite sets, principles of inclusion and exclusion, propositions. Relations and functions– introduction, a relation model for database. Properties of binary relations. Equivalence relations and lattices, partial ordering relations and lattices , Chain and antichains, a job Scheduling problems and the pigeonhole principles.

UNIT- II

Recurrence relations and recursive algorithm-Introduction, Recurrence, Relations, Linear Recurrence with Coefficient Solutions, particular solutions, Total Solutions, Groups and ring-Groups and Subgroups, Generators and Evaluations of Powers, Cosets and Lagrange Theorem, Permutation, Groups and Codes,

UNIT-III

Isomorphism and Automorphisms, Homomorphism and Normal Groups, Rings, Integral Domains and Fields, Polynomial Ring and Cyclic Codes, Boolean algebra's-Lattices and Algebraic System, Principles of Duality, Basic Properties of Algebra's of System, Defined by Lattices, Distributive and Complemented Lattices, Boolean Lattices and Boolean Algebra's . Uniqueness Finite Boolean Algebra's. Boolean Functions and Boolean Expressions, Prepositional Calculus.

UNIT- IV

Finite state machines-Introduction, Finite State Machines, Finite State Machine as Model of Physical System, Equivalent Machines, Finite State Machine as Language Recognizers.

TEXTS & REFERENCE BOOKS:

- **ELEMENTS OF DISCRETE MATHEMATICS** BY C.L.LIU–MCGRAW–HILLS PUB.
- **APPLIED DISCRETE STRUCTURE FOR COMPUTER SCIENCE** BY ALAN DOERR AND KENNETH LEVASSUR-GALGOTIA PUBLICATION

MCA1 – E3 System Analysis & Design

Unit-I

What is an organization? Features of organization? Organizational structure, Data & Information. What is an information system? A framework for information system. Relationship between organization, information systems and business process.

Unit-II

Definition of System, types of system, The need for framework & models, General model of system. A framework for information system architecture. Information system resources. Characteristics of information system.

Unit-III

Need for system analysis and design, system analysis phases of a project, system design phases of project. What is software life cycle model, traditional software life cycle models. System development life cycle and methodology.

Unit-IV

System design architecture, System architecture and is importance, Elements of Architecture design. Creating an architecture design. System implementation system maintenance.

Book:

- Jeffery. L Whitten, Lonnie D. Bently, System Analysis and Design, Tata Mc Graw-Hill Publishing Company, Ltd, Delhi.
- Alan Dennis, Barbara Haly Wisom, "System Analysis & Design"Wiley India Private Ltd, Delhi.

UNIT–I

Introduction to organization and architecture System Buses :Computer Components, Computer Function, Interconnection Structures, Bus Interconnection, PCI. Input/Output - External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels and Processors The External Interface.

UNIT-II

Computer memory, Internal memory - Computer Memory System Overview, Semiconductor Main Memory, Cache Memory, Advanced DRAM Organization. External Memory - Magnetic Disk, RAID, Optical Memory, Magnetic Tape Computer Arithmetic and Instruction - The Arithmetic and Logic Unit (ALU), Integer Representation, Integer Arithmetic, Floating – Point Representation, Floating-Point Arithmetic.

UNIT-III

Instruction sets Characteristics and Functions, Machine Instruction Characteristics, Types of Operands, Types of Operations, Assembly Language Instruction Sets : Addressing Modes and Formats, Addressing, Instruction Formats, CPU structure and function Processor Organization, Register Organization,

UNIT–IV

The Instruction Cycle, Instruction Pipelining, The Pentium Processor, The PowerPC Processor

Reduced instruction set computers (RISC), Instruction Execution Characteristics, Reduced Instruction Set Architecture Control Unit Operation - Micro - operations, Control of the CPU, Hardwired Implementation

TEXTS & REFERENCE BOOKS :

- **COMPUTER ORGANIZATION AND ARCHITECTURE** BY *WILLIAM STALLINGS TMH PUBLICATION*
- **COMPUTER SYSTEM ARCHITECTURE**: BY *M. MORRIS MANO*
- **DIGITAL LOGIC AND COMPUTER DESIGN** BY *M. MORRIS MANO*

MCA202-PROGRAMMING IN VISUAL BASIC

(19)

UNIT-I

Integrated Development Environment of VB, User Interface Designing, Basics of Event driven programming, Form- Designing, Showing & Hiding VB language -Data Types, Variables & Constant, Arrays, Dynamic Arrays, Array as function, Collections, Procedures, Arguments

passing, Functions, Returning Values. Control flow Statements: if-then, if-then-else, Select case, looping statement: Do-Loop, For-Next, While-Wend, Nested Control Structure, Exit statement.

UNIT-II

Basic Active X Control, Properties & Methods - Text box, List box, combo box, Scroll bar, Slider & Fire Controls. Advance Active X Control - Common Dialog controls, Color, font, File open, file save, print help, tree View & list View Controls. Graphics controls - ImageBox & PictureBox, Coordinate System, Graphics methods- Text Drawing, Lines & Shape, Filling Shapes, Grid methods Menu editor: Pull-down, Pop-up and Dynamic menus

UNIT-III

Multiple Document Interface - Parent & Child Forms & Methods. OLE - Basics, OLE control Properties & Methods, Developing applications with OLE control, OLE at Runtime.

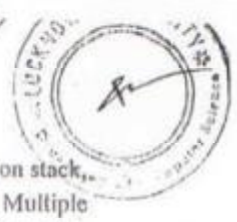
Error handling in VB - Types of Errors, Error handling methods and functions

UNIT-IV

Database Programming with VB – Database Models, Visual data manager, DATA Control- methods, Properties, Connectivity with database, DATA bound controls RDO Data control, creating & using database with object model. ADO data control, creating & using database with object model, Attaching Queries with database. DATA Report Designer

TEXTS & REFERENCE BOOKS:

- **SPECIAL EDITION USING VISUAL BASIC 6.0** BY *BRIAN SILER PRENTICE HALL(2000)*
- **MASTERING VISUAL BASIC 6** BY *EVANGELOS PETROUTSOS BPB PUBLICATIONS*
- **BEGINNER'S GUIDE TO VISUAL BASIC 6** BY *REETA SAHOO & G.B. SAHOO,KHANNA PUBLISHING HOUSE*
- **PETER NORTON'S GUIDE TO VISUAL BASIC 6** BY *PETER NORTON*
- **BEGINNING VISUAL BASIC 6** BY *PETER WRIGHT, SHROFF PUBLISHERS*
- **PROGRAMMING IN VISUAL BASIC 6.0** BY MOHAMMED AZAM, VIKAS PUBLISHING HOUSE
- **VISUAL BASIC 6 SUPER BIBLE** BY *DAVID JUNG, BOUTAIN, PARDUM,TECHMEDIA PUBLICATIONS*



UNIT-I

Introduction to data structures, Abstract data types Stacks - Introduction to stack & primitive operation on stack, Stack as an abstract data type, Stack's applications - Infix, post fix & Prefix expressions, Recursion, Multiple stacks Queues -Introduction to queues, Primitive Operations on the Queues,Queue as an abstract data type, Circular queue, Dequeue, Priority queue.

UNIT-II

Linked List - Introduction to the Linked List, Operation on Linked List, Linked List representation of stack and Queue,Header nodes. Types of Linked List - Doubly Linked List, Circular Linked List Application of Linked List.

UNIT-III

Trees -Basic Terminology of Trees, Binary Trees, Tree Representations as Array & Linked List Binary tree representation, Traversal of binary trees - In order, Preorder & post order, Application of Binary tree, Threaded binary tree Balanced tree, AVL tree, B-tree, B+ & B* trees, Conversion of General Tree to Binary Tree, Counting Binary Trees, 2-3 Trees, algorithm for manipulating 2-3 Trees.

UNIT-IV

Searching - Sequential Searching, Binary search and their Comparison. Sorting - External & Internal sorting, Insertion sort, Selection sort, Quick sort, Bubble sort, Heap sort, Merge sort, Comparison of sorting methods Algorithms of sorting and searching in Linked list and Arrays, Tables - Hash table, Collision resolution Techniques. Graphs - Introduction to graphs, Basic Terminology, Directed, Undirected & Weighted graph, Representation of graphs, Warshall's algorithem for path matrix and shortest path Graph Traversals-Depth first & Breadth first search. Spanning Trees, minimum spanning Tree, The basic Greedy Strategy for computing Algorithm of Kruskal, and Prim Applications of Graphs: Shortest path and Longest Path Problems.

TEXTS & REFERENCE BOOKS:

- **FUNDAMENTALS OF DATA STRUCTURE** BY *S. SAWHNEY & E.HOROWITCH*
- **DATA STRUCTURE** BY *TREMBLAY & SORRENSON*
- **DATA STRUCTURE** *SCHAUM'S OUTLINE SERIES, MCGRAW HILL PUBLICATION*

MCA204- Computational Numerical Methods

UNIT-I

Solving Non linear Equations - Computer & Arithmetic Errors, Method of Bisection, The Secant Method Newton – Raphson Method, Newton's Method for Polynomial, Horner's Method, Muller's Method Order o Convergence of other method.

UNIT-II

Solving sets of Equations - Matrix Notation, Determinants and Matrix inversion, Norms, The Elimination Method, Gauss and Gauss-Jordan Method, Iterative Method.

UNIT-III

Interpolation - Forward Differences, Lagrangian Polynomial, Divided Differences for a Polynomial Error of Interpolation, Least Square Approximation, Numerical Differentiation and Integration - Derivatives from difference table, High order Derivatives, Extrapolation Techniques, Newton cotes Integration Formula, The trapezoidal Rule, Simpson'sRule.

UNIT-IV

Numerical Solution of of Ordinary differential Equations – The Taylor-series Method, Euler and Modified Euler Methods, Runge- Kutta Method

TEXT & REFERENCE BOOKS:

- APPLIED NUMERICAL ANALLYSIS(VTH EDITION) BY *F.GERALD, PITRICK O.WHEATLEY*

MCA205P	Programming Lab-II (Visual Basic and Data Structure and Algorithms Using 'C' Language)

Elective-II (Subjects)

MCA2 – E1 Assembly Language Programming and Microprocessor

UNIT-I

Microprocessor Architecture and its operation, Microprocessor initiated operation, Bus organisation of 8085, Registers, Memory unit of 8085, I/O device, Interfacing devices, Pin out Diagram of 8085 Bus timing, ALU of 8085 and its flags, Instruction set of 8085, Classification of Instructions.

UNIT II

Programming Of Microprocessors : Addressing Modes, Data transfer operation commands., Arithmetic operation commands, Logic operation commands, Branch operation commands, Writing and debugging simple assembly Language program, Tools for developing assembly Language program, Writing programs using an assembler, Branching looping and Indexing

UNIT III

Stack, Subroutine, Conditional Call and return instructions., Advanced instructions –LHLD, SHLD, XCHG, PUSH, POP, XTHL, PCHL, Assembly Programs of addition, subtraction, multiplication and division of multi byte signed and unsigned numbers,. 8086 Pin Description, Operating modes, Registers of 8086, 8086 Bus Cycle, Addressing Modes of 8086

UNIV–IV

INTERFACING THE I/O PERIPHERALS : Basic Interfacing concepts, Interfacing output display, Interfacing input key board.

TEXTS AND REFERENCE BOOKS:

- **MICROPROCESSORS AND INTERFACING** BY D.V. HALL TMH, 2ND EDITION.
  IBM PC ASSEMBLY LANGUAGE PROGRAMMING BY PETER ABLE, PHI

MCA2 – E2 ACCOUNTING AND FINANCIAL MANAGEMENT WITH TALLY

(23)

UNIT-I

Book-keeping and Accounting -- Accounting - Branches of Accounting - Concept and Role of Financial Accounting and Management Accounting - International Accounting Standards. Financial Accounting - Concepts and Conventions - Double Entry System - Preparation of Journal, Ledger and Trial Balance - Preparation of Final Accounts: Trading, Profit and Loss Account and Balance Sheet - Groups interested in Accounting Information-Introduction to Tally Package.

UNIT-II

Capital and Revenue Expenditure and Receipts - Depreciation - Meaning - Causes Methods of Calculating Depreciation: Straight Line Method, Diminishing Balance Method and Annuity Method.

UNIT-III

Financial statement analysis and interpretation - Types of Analysis - Objectives - Tools of Analysis - Ratio Analysis: Objectives, Uses and Limitations - Classification of Ratios: Liquidity, Profitability, Financial and Turnover Ratios - Funds Flow Analysis and Cash Flow Analysis: Sources and Uses of Funds, Preparation of Funds Flow statement, Uses and Limitations.

UNIT -IV

Breakeven Analysis - Cost Volume Profit Relationship - Applications of Marginal Costing Techniques: Fixing Selling Price, Make of Buy, Accepting a foreign order, Deciding sales mix.Cost Accounting - Concepts - Distinction between Costing and Cost Accounting - Elements of Cost - Preparation of Cost Sheet - Types of Costs.

TEXT BOOKS & REFERENCES:

- Horngren.C.T., ACCOUNTING FOR MANAGEMENT CONTROL - AN NTRODUCTION, Englewood Cliffs, Prentice Hall, 1965.
- Anthony,r.N., MANAGEMENT ACCOUNTING-TEXT AND CASES, Homewood,R.D., Inwin, 1964.
- . Charumathi,B and Vinayakam,N., FINANCIAL ACCOUNTING, S.Chand & Company Ltd., New Delhi, 2002.
- Maheswari,S.N., MANAGEMENT ACCOUNTING, Sultan Chand & Sons, New Delhi.
- Hingorani, Ramanathan & Grewal, MANAGEMENT ACCOUNTING.6. Jain S.P. and Narang, K.L., COST ACCOUNTING.

[illegible] Software Quality Controls

MCA 2-E3

(24)

Unit-I

Introduction to Quality Control, quality control, quality assurance system, responsibility for quality, company-wide quality management, benefits of companywide quality control, quality problem solving, quality cost categories, the meaning of quality in software.

Unit-II

Software Quality, the place of software quality in project planning, the importance of software quality, defining software quality, ISO 9126, practical software quality measures, product versus process quality management, external standards, techniques to help enhance software quality, quality plans.

Unit-III

Software Quality Control Management, Introduction, software life cycle phases, software quality attributes, software quality assurance activities, software quality management.

Unit-IV

Quality through Knowledge Management: Introduction, baldridge criteria, ISO 9000-2000 quality management system, R & D program- A knowledgement management perspective, Reliable products through quality management system.

TEXT BOOKS & REFERENCES:

- Brijendra Singh, "Quality Control & Reliability Analysis, Khanna Publisher, Delhi.

UNIT- I

Introduction to database systems-Operational Data, File Management Vs Data Management, characteristics of Database approach, An Architecture for a Database System, Advantages and Disadvantages of DBMS, Data associations - Entities, Attributes and Associations, Relationship among Entities, Representation of Associations and Relationship, Data Model Classification, Entity Relationship Model, Relational Data Model, Network Data Model, Hierarchical Data Model Objects – Relational Model Objects, Relationship, Composite Objects, Procedures, Types and Inheritance.

UNIT-II

Relational data structure-A Review of Set Theory, Relations, Domains and Attributes, Tuples, Keys. Integrity Rules Extensions And Intensions, Base Tables, Indexes Relational Algebra and Operations, Retrieval Operations, Relational Calculus and Domain Calculus,

UNIT-III

Relational database design-Universal Relation, Anomalies in a Database, Normalization Theory, Functional Dependencies. Closure of a Set of F.D Covers, Non Redundant and Minimum Cover, Canonical Cover, First, Second and Third Normal Forms, Relations with more than one Candidate Key, Good and Bad Decompositions, Boyce Codd Normal Form, Multivalued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal form.

UNIT-IV

Query processing-Query Processing Stages, Query Interpretation, Equivalence of Expression, Query Execution Statistics, Query Execution Plan, Query Estimation, Query Evaluation, View Processing, Integrity & Security, Need for Integrity and Security Integrity Constraints, The distributed databases-Motivation for Distributed Database. Distributed Database concepts, Types of Distribution Architecture of Distributed Databases, The Design of Distributed Databases, Commit Protocols for Distributed Databases, Multi Database System.

Distributed Databases feature in Contemporary Database Management System.

TEXTS & REFERENCE BOOKS:

- **AN INTRODUCTION TO DATABASE SYSTEM** (3rd ED.) BY *C. J. DATE*
- **DATABASE SYSTEM CONCEPTS** BY *HENRY F. KORTH*
- **DATABASE MANAGEMENT SYSTEMS** BY LEON & LEON , VIKAS PUBLICATIONS.
- **AN INTRODUCTION TO DATABASE SYSTEM** BY *BIPIN C. DESAI*
- **FUNDAMENTALS OF DATABASE SYSTEM** (2nd ED.) BY *ELEMESRI AND S.NAVATHE*

MCA302-Theory of Computation

UNIT-I

Theory of Computation: Formal language, Need for formal computational models, Non-Computational problems, Diagonal argument and Russel's paradox

UNIT-II

Deterministic Finite Automaton (DFA), Non-deterministic Finite Automation (NFA). Regular languages and regular sets, Equivalence of DFA and NFA, Minimizing the number of states of a DFA, Non- Regular languages, Pushdown Automaton (PDA), Deterministic PushDown Automaton (DPDA), Non-equivalence of PDA & DPDA.

UNIT-III

Context free grammars. Greibach Normal Form (GNF) and Chomsky Normal Form (CNF), Ambiguity, Parse free representation of Derivations. Equivalence of PDA's and CFG's . Parsing techniques for parsing of general CFG's

UNIT-IV

Turing machine(TM): One tape, Multitape . The notions of time and space complexity in terms of TM. Construction of TM for simple problems. Computational complexity. Chomsky Hierarchy of language : Recursive and Recursively – enumerable languages.

TEXTS AND REFERENCE BOOKS:

- **INTRODUCTION TO AUTOMATION THEORY, LANGUAGES & COMPUTATION** BY JOHN E HOPCROFT, RAJEEV MOTWANI, JEFFREY D.ULLMAN.
- **THEORY OF COMPUTER SCIENCE (AUTOMATA, LANGUAGES AND COMPUTATION** BY *MISHRA & CHANDRASEKARAN (2ND EDITION) PHI ISBN-81-203-1271-6*
- **ELEMENTS OF THE THEORY OF COMPUTATION** BY *LEWIS & PAPADIMITRIOU* , PHI ISBN 81-203-1016-0
- **INTRODUCTION TO LANGUAGES AND THEORY OF COMPUTATION** BY *JOHN C. MARTIN (2ND EDN)ISBN- 0-07-463722-3*
- **THEORY OF COMPUTATION** BY BERNARD M. MORET PEARSON ISBN- 81-7808-550
- **FUNDAMENTALS OF THEORY OF COMPUTATION** BY *RAYMOND GREENLAW* & H. JAMES HOOVER (HARCOUNT) ISBN : 81-7867-036-4
- **ELEMENTS OF DISERETE MATHS** BY C.L.LIU TMH 2ND EDN ISBN-0-07- 043476-X

(27)

UNIT–I

Overview Of C++ : Object Oriented Programming, Introducing C++ Classes, Concepts of Object Oriented Programming, C++ as a superset of C, New style comments, main function in C++, meaning of empty argument list, function prototyping, default arguments and argument matching. User defined data types: enumerated types, use of tag names, anonymous unions, scope of tag names Classes & Objects :Classes, Structure & Classes, Union & Classes, Inline Function, Scope Resolution operator, Static Class Members: Static Data Member, Static Member Function, Passing Objects to Function, Returning Objects, Object Assignment. Friend Function, Friend Classes

UNIT–II

Array, Pointers References & The Dynamic Allocation Operators: Array of Objects, Pointers to Object, Type Checking C++ Pointers, The This Pointer, Pointer to Derived Types, Pointer to Class Members, References: Reference Parameter, call by reference and return by reference Passing References to Objects, Returning Reference, Independent Reference, C++'S Dynamic Allocation Operators, Initializing Allocated Memory, Allocating Array, Allocating Objects. Constructor & Destructor : Introduction, Constructor, access specifiers for constructors, and instantiation, Parameterized Constructor, Multiple Constructor in A Class, Constructor with Default Argument, Copy Constructor, Destructor.

UNIT–III

Overloading as polymorphism Function & Operator Overloading : Function Overloading, Overloading Constructor Function Finding the Address of an Overloaded Function, Operator Overloading: Creating A Member Operator Function, Creating Prefix & Postfix Forms of the Increment & Decrement Operation, Overloading The Shorthand Operation (i.e. +=,-= Etc), Operator Overloading Restrictions, Operator Overloading Using Friend Function, Overloading New & Delete, Overloading Some Special Operators, Overloading [ ], ( ), -, Comma Operator, Overloading << And . Namespaces: global namespace and namespace std, nested namespaces

UNIT–IV

Inheritance : Base Class Access Control, Inheritance & Protected Members, Protected Base Class Inheritance, Inheriting Multiple Base Classes, Constructors, Destructors & Inheritance, When Constructor & Destructor Function are Executed, Passing Parameters to Base Class Constructors, Granting Access, Virtual Base Classes . Virtual Functions & Polymorphism : Virtual Function, Pure Virtual Functions, Early Vs. Late Binding. Templates and Exception, Exception handling in C++, try, throw, catch sequence, multiple catch blocks, uncaught exceptions, catch-all exception handler Templates: Reason for templates compactness and flexibility, function template examples explicit specialization, class templates, out of class definition of member functions The C++ I/O System Basics : C++ Streams, The Basic Stream Classes C++ Predefined Streams, Formatted I/O: Formatting Using The Ios Members, Setting The Formal Flags, Clearing Format Flags, An Overloaded Form Of Setf ( ), Using Width() Precision() and Fill(), Using Manipulators to Format I/O, Creating Your own Manipulators.

TEXT & REFERENCE BOOKS:

- **C++ THE COMPLETE REFERENCE** BY *HERBERT SEHILDT – TMH*
- C++ BY *BALGURUSWAMI – TATA MCGRAW HILLS*
- C++ BY M. KUMAR, TATA MCGRAW HILLS

Unit –I

Computer network: A brief history, application of network; Network Topology: Bus, star, Ring, Tree, mesh and combined topology: LAN, MAN, WAN, Virtual Private Network; Standards and standards organization, Network Architecture and OSI Model.

Unit – II

Communication media and data transmission, Analog and digital data transmission, Modulation and Demodulation, Transmission media, Wireless communications, Interfacing, Multiplexing, error detection and correction, Data Link Control and Protocol concepts.

Unit – III

LAN Transmission equipments: network interface card, repeater, hub, bridge, router, switches, gateways; Pure Aloha, Slotted Aloha, CSMA, CSMA/CD, Token Bus: IEEE standard 802.4, Token ring: IEEE standard 802.5, Fiber Distributed Database Interface (FDDI), DQDB: IEEE standard 802.6.

Unit –IY

WAN protocols: x.25,SLIP,PPP: Integrated Services and Routing Protocols, Internetworking, GSM,GPRS, Internetwork Protocol (IP), IPv4 TCP/IP, FTP,SMTP, Telnet, Electronic Mail, Domain name system, www, Network security Concept.

TEXT & REFERENCE BOOKS:

- Brijendra Singh, " Data Communication & Computer Network", PHI Learning Private Limited, New Delhi 4th edition,2014
- **COMPUTER NETWORKING** BY *ANDREWS* TANANBAUM
- **DATA AND COMPUTER COMMUNICATION**: BY WILLIAM STALLINGS

MCA305P	Practical Lab-III (RDBMS and OOPs Using C++)

Elective – III (Subjects)

MCA3- E1 Operating System

UNIT– I

Definitions, Components and types of Operating system, Operating System Services, System Calls, System Programs, System Structure, System Design and Implementation, System Generations.

UNIT–II

Process Concepts, Process State & Process Control Block, Process Scheduling, Scheduling, Criteria, Scheduling Algorithms, Multiple- Processor Scheduling Real-Time Scheduling. The Critical Sections Problem

UNIT–III

Semaphores, Classical Problem of Synchronization, Monitors, Atomic Transactions, System Model, Deadlock Characterizations, Method for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock, Combined Approach to Deadlock, Storage management Logical Versus Physical Address Space, Swapping, Contiguous Allocating, Paging, Segmentation, Segmentation With Paging, Virtual Memory

UNIT–IV

Demand Paging, Performance of Demand Paging, Page Replacement, Page Replacement Algorithms, Allocation of Frames, Thrashing, Demand Segmentation I/o system Overview, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Performance, Disk Structure, Disk Scheduling, Disk Management, Swap Space Management, Disk Reliability, Stable Storage Implementation.

TEXT & REFERENCE BOOKS :

- **OPERATING SYSTEM CONCEPTS** BY SILBERSCHATZ & GALVIN, ADDISON WESLEY PUBLICATION
- **OPERATING SYSTEM CONCEPTS & DESIGN** BY *MILAN MILEN KOVIC,TMH PUBLICATION*

(30)

UNIT I

Framework of Management Information Systems: Importance's of MIS, Concepts of Management, information, system, Definition of MIS, information technology and MIS, nature and scope of MIS, MIS characteristics and functions, Structure and classification of MIS: structure of MIS, MIS classification, Brief introduction of functional information system, financial information system, marketing information system, production/ Manufacturing information system, human resources information system.

UNIT II

Decision making and MIS: decision making, Simon's model of decision making, types of decisions, purpose of decision making, level of programmability, knowledge of outcomes, methods of choosing among alternatives, decision making and MIS. Information and system concepts: types of information: strategic information, Tactical information, Operational information. Information quality, dimensions of information, System: Kinds of Systems, System related concepts, , elements of systems, Human as an information processing system.

UNIT III

System development stages: System investigation, system analysis, system design, construction and testing, implementation, maintenance. System development approaches (a brief introduction) : waterfall model, prototyping, iterative enhancement model, spiral model. System analysis: introduction, requirement definition, , strategies for requirement definition, structured analysis tools: data flow diagram, data dictionary, decision trees , structured English, decision trees. System Design: objectives, conceptual design, design methods, detailed system design.

UNIT IV

Implementation and evaluation of MIS: implementation process, Hardware and software selection, Evaluation MIS, System maintenance. Information system Planning: Information system Planning, planning terminology, the Nolan stage model, selecting a methodology, information resources management. Information system(IS) as an Enabler: introduction, changing concepts of IS , IS as an enabler

TEXT & REFERENCE BOOKS:

- D.P. Goyal, "Management information systems", Macmillan India Ltd.
- Bentley,"System Analysis and Design", TMH
- Robert G. Murdick & Joel E. Ross & James R. Claggett, "Information Systems for Modern Management" PHI.
- Gordon B. Davis & M.H. Olson, "Management Information Systems: Conceptual Foundation, structure & Development".

MCA3- E3 Reliability Engineering

Unit-I

Introduction to Reliability, the definition of reliability, history of reliability, bathtub curve, causes of failures, various phases in equipment life, reliability planning, reliability mathematics, set theory, Boolean algebra, probability concepts, probability laws, probability distributions, discrete distributions, continuous distributions.

Unit-II

Component Reliability and Hazard Model, component reliability from test data, difference between failure rate and Hazard rate, time-dependent Hazard Model, mean time between failures, mean time to failure (MTTF), Markov Models.

Unit-III

Reliability of Complex Systems, Evaluation concepts, application of Cut-set and Path Set, enumeration of Minimal Cut-sets/Path-sets, reliability of systems with complex structures, system reliability evaluation by decomposition, system reliability evaluation by recursive technique, reliability of three-state device systems, reliability of system in the presence of common cause failure.

Unit-IV

Maintainability and availability: Introduction, nature maintenance, explanation of maintainability, nature of availability, reliability and maintainability trade-off

TEXT & REFERENCE BOOKS:

- K.K. Agarwal, "Reliability Engineering" Kluwar Science Publisher, England.

Polynomial and Exponential algorithms, big "oh" and small "oh" notation, exact algorithms and heuristics, [illegible] / deterministic algorithms, static and dynamic complexity, stepwise refinement.

Unit-II

Subgoals method, working backwards, work tracking, branch and bound algorithms for traveling salesman problem and knapsack problem, hill climbing techniques, divide and conquer method, dynamic programming, greedy methods.

Unit-III

Sequential search, binary search, block search, Fibbonacci search, bubble sort, bucket sorting, quick sort, heap sort, average case and worst case behavior, FFT.

Unit-IV

Minimum spanning, tree, shortest path algorithms, R-connected graphs, Even's and Kleitman's algorithms,

max-flow min cut theorem, Steiglitz's link deficit algorithm.

SELECTED TOPICS

NP Completeness Approximation Algorithms, NP Hard Problems, Strasseu's Matrix Multiplication

Algorithms, Magic Squares, Introduction To Parallel Algorithms and Genetic Algorithms, Monti-Carlo Methods, Amortised Analysis.

TEXT & REFERENCE BOOKS :

- D.P. Goyal, "Management information systems", Macmillan India Ltd.
- Sara Baase, "Computer Algorithms : Introduction to Design and Analysis", Addison Wesley, 1988.
- T.H.Corman, C.E.Leiserson and R.L.Rioest, "Introduction to Algorithms", Mc Graw Hill, 1994.
- E.Horowitz and S.Sahni, "Fundamentals of Computer Algorithms", Galgotia Publications, 1988.
- D.E.Goldberg, "Genetic Algorithms : Search Optimization and Machine Learning", Addison Wesley, 1989.

(33)

UNIT – I

SOFTWARE : Software Characteristics, Components & Applications, Software Engineering - A Layered Technology, Software Process Models • Linear Sequential Model, Prototype & Rad Model, Evolutionary Software Process Model – Incremental Model and Spiral Model. SOFTWARE PROJECT MANAGEMENT : Project Management Concepts – People Problem and Process S/W PROCESS AND PROJECT METRICS : Metrics In The Process and Project Domains . Software Measurement –Size Oriented, Function Oriented Metrics, Extended Function

UNIT - II

SOFTWARE PROJECT PLANNING: Objectives, Scope, Project Estimation, Decomposition Techniques, Empirical Estimation Models. ANALYSIS CONCEPT AND PRINCIPLES : Requirement Analysis, Communication Techniques, Analysis Principles, Software Prototyping, Specifications. ANALYSIS MODELING: Elements of The Analysis Modeling, Data Modeling . Functional Modeling and Information Flow, Behavioral Modeling, Data Dictionary.

UNIT – III

DESIGN CONCEPTS AND PRINCIPLES: Design Process, Design Concepts, Design Principles, Effective Modular Design . DESIGN METHODS : Architectural Design Process, Transform Mapping and Transaction Mapping,Interface Design, - Internal and External Design, Human computer Interface Design, Interface Design Guidelines, Procedural Design,

UNIT - IV

S/W Quality Assurance : Quality Concepts, Matrix for Software Quality, Quality Movement, S/W Q A, S/W Review, Formal Technical Reviews, Formal Approaches to Sqa, S/W Reliability, ISO 9000quality Standards S/W TESTING MODELS : S/W Testing Fundamentals, Test Case Design, White and Black Box Testing, Basic Path Testing, Control Structure S/W TESTING STRATEGIES : Strategic Approach To S/W Testing, Unit Testing, Integration Testing, Validation Testing, System Testing, Debugging, S/W REUSE : Reuse Process, Building Reuse Components, Classified And Retrieving Components, Economics Of S/W Reuse COMPUTER AIDED S/W ENGINEERING: Introducing of Case, Building Block For Case, Taxonomy Of Case Tools, Integrating Case Environment, Integrating Architecture, Case Repository

TEXTS & REFERENCE BOOKS :

- **Software Engineering** By R.S.Pressman
- **An Integrated Approach To Software Engineering** By Pankaj Jalote

UNIT – I

Data Warehousing Concept and Definition Operational Data, Common Characteristics of Data Wa Knowledge Discovery and Decision Making, Knowledge Discovery and Data Mining, Application Warehouse .

UNIT – II

Find User Data Access Tools – Data Warehouse Query Tools, Data Modeling Strategy - Star Schema, Fact Table Star Schema, Star With The Original Entry Relationship Model, Dimensional Model, C Relational OLAP, Multidimensional Database, The Data CubePresentation of Fact Tables

UNIT – III

Data Warehouse, Architecture and Optimization – 3 Tier Architecture, Oracle Warehouse, Components of Oracle Data Warehouse, Classical Data Warehouse, Advantages of Using An Oracle Server, Transportaion Data Into The Data Warehouse, Data Created in The Data Warehouse, Presentation of Data To End Us Object Oriented System Architecture Definitions, Object Modeling Techniques,

UNIT – IV

Oracle Feature Suitable for Data Warehousing, Application Planning The Infrastructure – Oracle Serve Configuration, Infrastructure Suitable for The Data Warehouse Using Oracle of A Guidelines, Data Warehous Capacity Planning, Implementing of The Application Design, Necessity of data Warehouse Metadata Performance optimization, Data administration techniques.

TEXTS & REFERENCE BOOKS :

- **DATA WAREHOUSING WITH ORACLE** BY SIMA YAZDANI – SHIRLEY S. WONG

(35)

UNIT-I

History and design features of JAVA, how java works, basics of JAVA, Applications and Applets, using the tools in JDK, javadoc, java, jdb etc. Applet Programming - Creating and executing Java applets, inserting applets in a web page, Java security.

JAVA Language- Keywords, Constants, Variables, and Data Types. Operators and Expressions, Decision making, Branching and Looping, Labeled Loops Statement, Jump statements: Break,

Continue, and Return. Arrays and Strings-Creating an Arrays, one and two Dimension Arrays, String Array, String and String Buffer Classes, Wrapper Classes. Classes,Objects and Methods Defining a class, adding variables and Methods, creating objects constructors, class inheritance

UNIT-II

Inheritance, Basics types, using super, multi level hierarchy, abstract and final classes, object class, packages and interfaces, Access protection, Extending interfaces, packages. Exception Handling, Fundamentals exception types, uncaught exceptions, throws, throw, try -catch, final, built in exceptions, creating your own exceptions. Multithreading Fundamentals, Java Thread model : priorities, synchronization, messaging, thread class, Runnable interface, Interthread communication, suspending, resuming and stoping threads.

UNIT-III

Input/Output -Basics, Streams, Byte and Character streams, predefined streams, reading and writing from console and files .Using standard Java Packages (lang,util,io) Networking -Basics, networking classes and interfaces, using java.net package, doing TCP/IP and Datagram programming.

AWT Classes, Event Handling and Swing classes, AWT Programming, Working with windows, Graphics and Text, using AWT controls, Layout managers and menus, Handling image, animation, sound and video. Event Handling-Different mechanism, the Delegation Event Model, Event Classes, Event Listener interfaces, Adapter and Inner Classes..

UNIT-IV

Java Swing -Jappiet, Icons and Labels, Text fields, Buttons, Combo Boxes, Tabbed and Scroll Panes, Tree Tables, JDBC -Setting the JDBC connectivity with a backend database.RMI -Two tier and Multitier Architecture, Object serialization, RMI Fundamentals, Programming using Java RMI Classes and interfaces Servlets-Background, Life Cycle, Java Servlet Development kit, Servlet API, Handling HTTP Requests and responsing, Using Cookies, Session Tracking and security issues.

TEXTS & REFERENCE BOOKS :

- **JAVA THE COMPLETE REFERENCE** BY PATRICK NAUGHTON AND HERBERT SCHIELDT.
- **PROGRAMMING WITH JAVA** BY E. BALAGURUSWAMY.
- **USING JAVA 1.2** BY JOSEPH WEBER.
- **THINKING IN JAVA** By

Elective – IV (Subjects)

MCA4 – E1 Artificial Intelligence

UNIT–I

General issues and overview of AI, AI Techniques, AL problems, AI Techniques, importance and areas of AI, problem solving state space search-DLF, BFS Production system, problem characteristics. Heuristic Search Techniques: Generate and Test, Hill Climbing, Best First Search, Problem reduction, Constraint satisfaction-Cryptarithmetic and problems.

UNIT-II

Knowledge representation & mapping, approaches to knowledge to representation, Issues in knowledge representation, Representing simple facts in logic, representing instance and relationships, Resolution and natural deduction Representing knowledge using rules, Procedural v/s Declarative knowledge, Logic programming, Forward v/s Backward chaining, Matching & control knowledge.

UNIT–III

AI programming language: Prolog- objects, relationships, facts, rules and variables, Prolog: Syntax and data structures, representing objects & relationships by using "trees" and "lists", use of cut, I/O of characters and structures. Symbolic reasoning under uncertainty: Introduction to monotonic reasoning, Logics for Nonmonotonic reasoning, implementation issues, implementation: DFS & BFS.

UNIT–IV

Slot and filler structures: Semantic nets, frames, conceptual dependency, scripts, CYC Natural languages and NLP, Syntactic processing parsing techniques, semantic analysis case grammar,

augmented transition net, discourse & pragmatic processing, translation. Definition and characteristics of Expert System, representing and using domain knowledge, Expert system shells Knowledge Engineering, knowledge acquisition, expert system life cycle & expert system tools, CYCIN & DENDRAL examples of expert system

TEXTS & REGERENCE BOOKS:

- ARTIFICIAL INTELLIGENCE _ *RICH & KNIGHT*
- PROGRAMMING IN PROLOG-*CLOKSIN & MELLISH*
- INTRODUCTION TO ARTIFICIAL INTELLIGENCE & EXPERT SYSTEM
- PRINCIPLES OF ARTIFICIAL INTELLIGENCE – *NILLSON*
- FOUNDATION OF ARTIFICIAL INTELLIGENCE & EXPERT SYSTEM _*JANAKIRAMAN, SURUKESI & GOPAL KRISHNAN*

(37)

UNIT-I

ELECTRONIC COMMERCE -Technology & Prospects, Internet Commerce Architecture, Internet Based E-Commerce: Issues, Problems & Prospects. STRUCTURE OF ASP APPLICATION -Objects, Component, Integrating objects & components into ASP, Response Object, Request Object.

UNIT-II

HTML - Concepts of Hypertext, Versions of HTML, Elements of HTML syntax, Head & Body Sections, Building HTML documents, Inserting texts, Images, Hyperlinks, Backgrounds and Colour controls, Different HTML tags, Table layout and presentation, Use of front size & Attributes List types and its tags, Use of Frames and Forms in web pages, ASP & HTML Forms.

UNIT-III

Javascript Overview, Javascript and the WWW, JavaScript vs. VBScript, Javascript vs. Java, Javascript versions, Script element, Inline Javascript, Including Javascript. Functions : Functions Introduction, Calling functions, Javascript Comments : Comments overview, When to comment, Types of comments Variables : Variables overview, Declaring variables, Types of variables, Casting variables, Alert box.

Expressions : Arithmetic operators, Assignment operators, Logical operators, Expressions and precedence ,Statements : If statement, For statement, While statement, Break/Continue

UNIT-IV

Working with asp application -Application Concept, Application & the Global.asa file using Application object & variables,

USING ACTIVE SERVER PAGES WITH DYNAMIC HTML-Client-Side Form Validation

Working with the file system - Reading and Writing to a File, Working with Files, Working with Drives and Folder, Using asp with databases -Creating Connections with OLE DB and ODBC Connecting to Microsoft Access Database, Executing a SQL Statement with the connection object, Advanced Methods & Properties of connection object

Working with Recordsets - Retrieving a Recordset, Recordset Cursor and Locking Types, Advanced Methods and Properties of the Recordset Object

Generating Dynamic Content From the Server - Detecting Browser Properties, Using the Content Rotator Component, The Content Linking Component

Case Study on creating a Job Site

TEXTS & REFERENCE BOOKS:

- ACTIVE SERVER PAGES 2.0 (UNLEASHED) BY *STEPHEN WALTHER : TECHMEDIA.*
- ASP 3 PROGRAMMING BIBLE BY ERIC A. SMITH : IDG BOOKS(REPRINT2001)
- TEACH YOURSELF ASP 3.0 IN 21 DAYS BY SCOTT MITCHELL, JAMES ATKINSON : TECHMEDIA (1ST EDITION 2000)
- MASTERING ACTIVE SERVER PAGES 3.0 BY *RUSSELL JONES : BPB(1ST EDI 2000)*

MCA4 – E3 Cloud Computing

Unit-I

Why Cloud?, Business and IT Perspective, Cloud services requirements, cloud and dynamic Infrastructure, cloud computing characteristics, cloud adoption, cloud rudiments.

Unit-II

Cloud Deployment Models, Introduction, cloud characteristics, measured service, cloud deployment models, security in public cloud, public versus private clouds, cloud infrastructure self-service.

Unit-III

Cloud as a Service, Introduction, Gamut of cloud solutions, principal technologies, cloud strategy, cloud design and implementation using SOA, conceptual cloud model, cloud service defined.

Unit-IV

Cloud solutions, Introduction, cloud ecosystem, cloud business process management, cloud service management, on-premise cloud orchestration and provisioning engine, computing on demand (CoD), cloud sourcing.

TEXTS & REFERENCE BOOKS:

- Dr. Kumar Saurabh, "Cloud Computing", Published by Wiley India Pvt. Ltd, New Delhi.

UNIT – I

What is Graphics, Application of Graphics, Elements of Graphics Workstation, Graphics I/P Devices-Keyboard, Trackball, Joystick, Light Pen, Digitizing Tables, Mouse, Touch Panels, Image Scanners , Graphics Display Devices-Raster Scan System, Random Scan System, Arch Of Vector and Raster Scan Display, Refresh CRT, Gray S Haden

UNIT–II

DRAWING GEOMETRY: Point – Plotting, Coordinate System, Point Plotting, Line Drawing –Line Segments, Line Drawing Algo : DDA Algo , Bresenham's Line Algorithm.Circle Drawing Polygon Representation Ellipse, Rectangle, Filling – Filled Area Primitives, Scan Line PolygonFill Algo, Flood Fill Algo, Boundary Fill Algorithm.

UNIT–III

2D Geometric Transformation : Translation, Rotation, Scaling, Geometric Transformation, Coordinate Transform and Composite Transformation, 2D Viewing Transformation & Clipping : World Coordinate System (WCS), Normalized Device Coordinate System , Windows Viewing View Ports Viewing, Point Clipping, Line Segment Clipping, Coahen – Sutherland, Line Clipping , Polygon Clipping.

UNIT–IV

3D Geometric Transformation 3D Geometric Transformation :Translation, Rotation, Scaling. Coordinate Transform Geometric Transformation Composite Transformation, 3D Display Methods –Parallel Projection Perspective Projection 3D Viewing & Clipping, Segment, Segment Table, Segment Creation, Deletion, Closing, Renaming, Curve Generation , B – Spline Curves, Bezier Curves, idden Surface, Z – Buffer Algorithm, Scan Line Algorithm, Painters Algorithm, Depth Comparisons.

TEXT & REFERENCE BOOKS:

- COMPUTER GRAPHICS : A PROGRAMMING, APPROACH – STEVEN HARRINGLOM (MGH)
- COMPUTER GRAPHICS : SCHAUM'S OUTLINE SERIES
- COMPUTER GRAPHICS : DONALD HEAON & M. PAULIVE BAKER (PHI)

UNIT- I MULTIMEDIA: AN INTRODUCTION,TEXT, IMAGES & ITS PROCESSING TOOLS

Needs and Area to Use and Develop Multimedia Software ? Multimedia Development Team and Skills, MAC V/S Windows Platform, Basic Tools for Development Multimedia Application, Multimedia Building Blocks, Making Simple Multimedia with Popular Applications. Stages of Multimedia Design : Planning, Content Analysis, Instructional Design, Preparation of Media Elements, Integration of Media Elements Authoring, Evolution, Text-Plain Text and Formatted Text, Image –Types of Graphics-Vector and Raster, Attributes of Image-Resolution, Images, Pixel Depth, Color, Color Palates, Compression of Images and its Affects to Quality and Storage Size, Various Files Formats – BMP, DIB, EPS, CIF, PEX, PIC, TGA and TIF Formats The Windows Meta Files Formats, File Formats Conversion, Compression Techniques-REL Compression, LZW Compression, JPEG Fractal Compression and Wavelet Compression Processing Tools –Techniques of Capturing Image and Converting Image, Software Tools for Processing Images Techniques of Special Text Effects Using Various Software.

UNIT – II: DIGITAL SOUND - ITS CAPTURING AND EDITING TOOLS

Sound and it Attributes-Sound and its Effects in Multimedia, Sampling of Sound, Frequency, Sound Depth, Channels in Sound and Third Effects on Quality and Storage Size Estimation of Space of A Sound File, Sound Card Standard – Fm Synthesis Cards, Waves Table Cards, Midi and Mp3 Files and Devices, 3d Sounds, Capturing and Editing Sound Wave for Indo

UNIT- III ;COMPUTER ANIMATION - ITS TECHNIQUES AND DEVELOPMENT TOOLS

Animation and its Basic – Principals of Animation and its Use in Multimedia Computer System Configuration and Peripherals Requirements, Software for Animation, Effects of Resolution Pixel Depth Image Size on Quality and Storage Size Types of Animation, Step for Creating and Generic Animation Animation Techniques – Concept of Key Frame, Tracing and Path, 2D Animation Techniques : Tweaking, Morphing, Color Cycling, Walk Cycle Wrap, Rotation, 3D Animation Techniques : Lofting, Lighting Revolving Inverse Kinematics Morphing Key Framing Various Tools for Creating Animation Like Animation Pro 3D Studio Paint Shop Pro

Animation

UNIT- IV: DIGITAL VIDEO AND VIDEO MAKING TOOLS, MULTIMEDIA, AUTHORING AND VIRTUAL REALITY

Basic of Video – Analog and Digital Video Type of Video Computer System Configuration and Peripherals Required Digitization of Analog Video Type of Video Problems Due to Interlacing or Non Interlacing, Video Standard – NTSC, Pal, Secma, HDTV, Video Capturing Media Instruments Videodisk Camcorder Compression Techniques, File Formats AVI, MJPG, MPEG, Move Real Video, Video Editing and Movie Making Tools Quick Time Video for Window Adobe Premier, Selecting and Using and Authoring Tool Factor for Selecting And Authoring Tool Multimedia and Internet Tools Pro Web Multimedia Various Plug Ins for Web . HTML and Multimedia Designing Tips, Text and Image Pro Web Planning and Distribution of A Multimedia Project, Virtual Reality Terminology Head Mounts Display (HMD), Boom, Cave, Input Devices and Sensual Technology, Characteristic If Immersive Vr Shared Virtual Environments, Non Immersive VR,VRML, VR - Related Technology Application

TEXT & REFERENCE BOOKS :

- **MULTIMEDIA MAKING IT WORK (4TH EDITION)**-BY VAUGHAN TATA MEGRAW KILL
- **MULTIMEDIA IN ACTION** BY JAMES E SHUMAN, VIKAS PUBLISHING
- **MULTIMEDIA ON THE PC** BY – NORMAN DESMARASIS TATA MEGRAW HILL

UNIT – I

Automata Introduction to Finite Automata, Structure Representation, Automata and Complexity, Alphabets, String, Language Informal Picture of Finite Automata, Deterministic Finite Automata, Nondeterministic Finite Automata, An Application .

UNIT – II

Introduction To Compiler, Overview of Compilation, Process , Typical Compiler Structure, Implementing A Compiler . Programming Language Grámunars, Elements of A Formal Language Grammar, Derivation, Reduction & Syntax Trees, Ambiguity Regular Grammar & Regular Expression – Context Free Grammar.

UNIT – III

Scanning & Parsing Techniques – The Scanner, Regular Grammar and Fsa, Top Down Parsing, Parsing Algorithm, Top Down Parsing Without Backtracking. Predictive Parsers, Bottom Up Parsing, Parsing, Lr Parsers, Shift Reduce Parsing Symbol Table Organization, Memory Allocation – Static & Dynamic Memory Allocation, Compilation Control Transfer, Procedure Calls.

UNIT – IV

Conditional Execution, Iteration Control Construct, Lexical Syntax Errors, Semantic, Major Issues In Optimization, Optimizing, Transformations, Local Optimization, Program Flow Analysis, Global Optimization.

TEXTS & REFERENCE BOOKS :

- INTRODUCTION TO AUTOMATA THEORY, LANGUAGE AND COMUTATION – " JOHN E - HOPCOFT, RAJEEV MOTWANI, JEFFERY D. ULLMAN 2ND EDITION
- COMPILER CONSTRUCTION PRINCIPLES & PRACTICE – " D.M. DHAMDHERE 2ND EDITION
- PRINCIPLES OF COMPILER DESIGN – AFFRED V. AHO, JEFFERY D.ULLMANCOMPILERS PRINCIPLES, TECHNIQUES AND TOOLS – AFFRED V.AHO RAVI SETHI, JEFFERY D. ULLMAN.

MCA 504- Network Security

(42)

Unit – I

Why Network Security is needed? , Security Principles, Security attacks, Organization Policy and Security, Infrastructure components, Goals of Security Infrastructure, Security Models.

Unit – II

Cryptography, Data encryption methods, Cryptographic algorithms, Secrete Key Cryptography, Public key Cryptography, Message Digest, Digital signature speech cryptography.

Unit –III

Hardware and Software security, Smart Card, Biometrics, Kerberos, Public key Infrastructure, Pretty Good Privacy, Security Protocols, SSL, TLS, IPsec, S/MIME, Web security.

Unit –IV

Network Security, Fundamental concept, identification and authentication, Access Control, A Model for Network security, Malicious software, firewalls intrusion detection System, Wireless Security.

TEXT & REFERENCE BOOKS :

- Brijendra Singh, "Network security and Management", PHI Learning Private Limited, New Delhi, 2013 9 3rd Edition).
- W.Stallings, "Cryptography and Network Security: principles & Practice", Prentice Hall, 2nd Edition, 1998.

MCA505	Minor Project

1. Minor Project work may be done individually or in groups in case of bigger projects. However if project is done in groups, each student must be given a responsibility for a distinct module and care should be taken to see the progress of individual modules is independent of others.
2. Students should take guidance from an internal guide and prepare a Project Report on "Minor Project Work" in 2 copies to be submitted to the Department of Computer Science. Whenever possible, a separate file containing source-code listings should also be submitted.
3. Minor Project work can be carried out in the Department of Computer Science LU.
4. Evaluation of the Minor Project will be done by Examiner appointed by university of Lucknow.

Elective – Y (Subjects)

MCA5 – E1- Neural Networks

Unit -I

Neuro-physiology - General Processing Element - ADALINE - LMS learning rule - MADALINE - MR2 training algorithm. Back Propagation Network - updating of output and hidden layer weights -application o BPN – associative, memory - Bi-directional Associative Memory - Hopfield memory - traveling sales man problem.

Unit-II

SIMULATED ANNEALING AND CPN

Annealing, Boltzmann machine - learning - application - Counter Propagation network - architecture -trainin Applications.

Unit-III

SOM AND ART

Self organizing map - learning algorithm - feature map classifier - applications - architecture of Adaptive Resonance Theory - pattern matching in ART network.

Unit-IY

NEOCOGNITRON

Architecture of Neocognitron - Data processing and performance of architecture of spacio - temporal networks for speech recognition.

TEXT & REFERENCE BOOKS :

- J.A. Freeman and B.M.Skapura , "Neural Networks, Algorithms Applications and Programmir Techniques", Addison-Wesely. 1990.
- Laurene Fausett, "Fundamentals of Neural Networks: Architecture, Algorithms and Application Prentice Hall, 1994

MCA5 – E2 Pro[illegible]mming in VC++

(44)

UNIT- I ELEME[illegible]S OF GUI

Elements of GUI & Visual design, Designing and Creating a Visual C++ Program, Project work spaces, Debug and Release Targets, Cleaning up, various features of the Visual C++ IDE, Basics of Windows Architecture, Simple WIN 32 SDK executables,

UNIT-II MESSACES AND EVENTS

Basics of MFC & MFC-based executables, Understanding Message maps and message loops, Events and Event handling, Mouse events, Keyboard events, Dynamic data Exchange and verification, creating Menus, Modeless dialog boxes.

UNIT-III GRAPHICS & DOCUMENTS AND VIEWS

Device contexts, working with images, bitmaps and icons, creating bitmap buttons, creating and using Pens, Brushes, and Fonts, Document - View Architecture basics, the document class and view class, creating SDI applications, Multitasking, creating MDI Applications, Working with menu in documents, Toolbar and status bar.

UNIT-IV HANDLING FILE AND DATA APPLICATIONS

Printing and Print preview, Saving, loading and transferring data, Serialization, File handling, using Databases and Record views, Database access, The Visual C++ ODBC class.

TEXTS & REFERENCE BOOKS :

- CHARLES PETZOLD, *PROGRAMMING WINDOWS*, 5TH EDITION,MICROSOFT PRESS, 1999
- JEFF PROSISE, **PROGRAMMING WINDOWS WITH MFC**, MICROSOFT PRESS, 2000
- IVOR HORTON, **PROGRAMMING VISUAL C++ STANDARD EDITION**,WROX PRESS, 1999
- JON BATES AND TIM TOMPKINS, *PRACTICAL VISUAL C++ 6*, 2ND EDITION.
- CHUCK SPHAR, **LEARN VISUAL C++ NOW**, MICROSOFT PRESS/PHI, 1000
- DAVID KRUGLINSKI, GEORGE SHEPHERD & SCOT WINGO,**PROGRAMMING VISUAL C++**, MICROSOFT PRESS, INDIAN REPRINT,2000
- MIKE BLASZCZAK, **PROFESSIONAL MFC WITH VISUAL C++**, WROX PRESS, 1999, INDIAN REPRINT, 2000, SHROFF PUBLISHERS AND DISTRIBUTORS

MCA5 – E3 Software Project Management

Unit-I

Introduction to Software Project Management, why is software project management important? What is a project? Software projects versus other types of project, Contract management technical project management, Activities covered by software project management, Plans, methods and methodologies, some ways of categorizing software projects.

Unit-II

What is management? Problems with software projects, setting objectives, stakeholders, the business case, requirement specification, management control, overview of the project planning.

Unit-III

Programme management and project evaluation: introduction, programme management, managing the allocation of resources within programmes, strategic programme management, Evaluation of individual projects, technical assessment, const-benefit analysis, cash flow forecasting, cost-benefit evaluation techniques, risk evaluation, conclusion. Selection of appropriate project approach, software effort estimation, activity planning.

Unit-IV

Risk Management: introduction, risk, categories of risk, a framework for dealing with risk, risk identification, risk assessment, risk planning, risk management, evaluating risks to the schedule, applying the PERT technique, Monte Carlo Simulation, critical chain concepts, conclusion. Resources allocation, monitoring and control.

TEXTS & REFERENCE BOOKS :

- Bob Hughes & Mike Cotterell, "Software Project Management" Tata Mc Graw-Hill, Publishing Company Ltd, New Delhi.

MCA-VI Semester

Subject Code	Subjects
MCA601	Final Dissertation (Major Project External)
MCA602	Seminar/ Presentation (Major Project internal)

5. Project work may be done individually or in groups in case of bigger projects. However if project is done in groups, each student must be given a responsibility for a distinct module and care should be taken to see the progress of individual modules is independent of others.
6. Students should take guidance from an internal guide and prepare a Project Report on "Project Work" in 2 copies to be submitted to the Department of Computer Science. Whenever possible, a separate file containing source-code listings should also be submitted.
7. The Project Synopsis should contain an Introduction to Project, which should clearly explain the project scope in detail. Also, Data Dictionary, DFDs, ERDs, File designs and a list of output reports should be included.
8. The project Work should be of such a nature that it could prove useful or be relevant from the commercial/management angle.
9. The major project work carry 200 marks for internal assessment based on seminar/presentation and 400 marks for external viva based on final dissertation. The external viva shall be conducted by examiners appointed by University of Lucknow.
10. Project work can be carried out in the Department of Computer Science or outside with prior permission of the Head, Department of Computer Science LU..