

**Department of Computer Science & Information Technology Guru Ghasidas  
Vishwavidyalaya, Bilaspur (C.G.)  
SYLLABUS FOR MCA COURSE UNDER CHOICE BASED CREDIT SYSTEM (CBCS) \***

**Session 2017-2018 (On and after)**

**MCA**

**Note: The decision of the GG Vishwavidyalaya for implementing CBCS system on this course shall be final, rest will remain the same.**

**Semester 1**

Sno	Subject Code	Title	Credit		Marks		Credits
			L	P	Internal	External	
1	MCA-101	Introduction to Information Technology	4		40	60	4
2	MCA-102	Computer programming & Numerical Methods	4		40	60	4
3	MCA-103	Discrete Mathematical Structures	4		40	60	4
4	MCA-104	Data Structures using C	4		40	60	4
5	MCA-105	Computer Organization	4		40	60	4
6	MCA-106	LAB: Data Structure using C		1		100	1
7	MCA-107	LAB-II: Computer Hardware and Digital Electronics		1		100	1
		Total	20	02	200	500	22

**Semester 2**

Sno	Subject Code	Title	Credit		Marks		Credits
			L	P	Internal	External	
1	MCA-201	Principles of Operating System	4		40	60	4
2	MCA-202	Object Oriented Programming with C++	4		40	60	4
3	MCA-203	Theory of Computation	4		40	60	4
4	MCA-204	Elective I	4		40	60	4
5	MCA-205	Elective II	4		40	60	4
6	MCA-206	OOP Lab (C++)		1		100	1
7	MCA-207	LAB based on Elective- II		1		100	1
		Total	20	02	200	500	22

**Semester 3**

Sno	Subject Code	Title	Credit		Marks		Credits
			L	P	Internal	External	
1	MCA-301	Probability and Statistics	4		40	60	4
2	MCA-302	Artificial Intelligence	4		40	60	4
3	MCA-303	Relational Data Base Management System	4		40	60	4
4	MCA-304	Elective III	4		40	60	4
5	MCA-305	Elective IV	4		40	60	4
6	MCA-306	RDBMS LAB		1		100	1
7	MCA-307	LAB based on Elective –III / IV		1		100	1
		Total	20	02	200	500	22

**Semester 4**

Sno	Subject Code	Title	Credit		Marks		Credits
			L	P	Internal	External	
1	MCA-401	Design and Analysis of Algorithm	4		40	60	4
2	MCA-402	Compiler Design	4		40	60	4
3	MCA-403	Optimization Techniques	4		40	60	4
4	MCA-404	Elective V	4		40	60	4
5	MCA-405	Elective VI	4		40	60	4
6	MCA-406	Computer Network LAB		1		100	1
7	MCA-407	Minor Project		1		100	1
		Total	20	02	200	500	22

**Semester 5**

Sno	Subject Code	Title	Credit		Marks		Credits
			L	P	Internal	External	
1	MCA-501	Soft Computing	4		40	60	4
2	MCA-502	Computer Graphics and Multimedia	4		40	60	4
3	MCA-503	Data Mining and Data Warehousing	4		40	60	4
4	MCA-504	Elective VII	4		40	60	4
5	MCA-505	Elective VIII	4		40	60	4
6	MCA-506	Lab based on MATLAB		1		100	1
7	MCA-507	Minor Project		1		100	1
		Total	20	02	200	500	22

## Semester 6

Sno	Subject Code	Title	Credit		Marks		Credits
			L	P	Internal	External	
1	MCA-601	Major Project	-	-	-	500	15
		Total	-	-	-	-	15

Total Course Credits – 125

Note: Electives to be decided at the start of the respective semester

**\* The syllabus is subjected to change as per the requirement.**

## Electives

Sl.No	Paper Code	(1)	(2)	(3)
1	MCA-204 (Elective-I)	Computer Networks	System Analysis and Design	Introduction to Micro Processor
2	MCA-205 (Elective-II)	Object Oriented Software Engineering	Multimedia	Linux Operating System and Shell Programming
3	MCA-304 (Elective-III)	Advanced JAVA Programming	System Software	Neural Network
4	MCA-305 (Elective-IV)	Web Technology	Pattern Recognition	V.B.Net Programming
5	MCA-404 (Elective-V)	E-Commerce	Financial Accounting	Software Testing
6	MCA-405 (Elective-VI)	Mobile Application Programming	C# and .net Framework	Cloud Computing
7	MCA-504 (Elective-VII)	Big Data Analytics	Advanced Operating System	Parallel Processing
8	MCA-505 (Elective-VIII)	Management Information System	Network Security	Image Processing

**MCA-101**

**Introduction to Information Technology**

- 1. Introduction-** Basics concept of IT, Concept of data and information, Generations and Classification of Computers, Organization of computers: CPU, Memory, Input and Output devices, File organizations.
- 2. Software and Computer Languages-** Software, Types of software: System software, Application software, Utility software, Firmware. Generations and Types of Programming Languages, Programming Paradigms: procedural oriented and object oriented programming, Computer Security.
- 3. Communications and Internet-** Data communications, Analog and digital signal, Communication media, Network topology, Network categories, The OSI model and TCP/IP model, Internet addressing, Internet Service Provider (ISP), Web browsers, URL, WWW, HTTP, E-mail, File transfer, Domain Name System (DNS), Wireless technology: GPS, Wi-Fi.
- 4. Applications of IT-** IT in Home, Entertainment, Business, Industry, Science, Engineering and Medicine, Online banking, Online shopping, E-Learning, E-commerce, M-Commerce, E-Government.
- 5. Latest IT Trends-** Artificial intelligence, Data warehousing, Data mining, Overview of geographic information system (GIS), Cloud computing, Information and communications technology (ICT), Parallel computing, Introduction to web services.

**Readings:**

1. Fundamental of Computer 5<sup>th</sup> Edition By V. Rajaraman, PHI Publication.
2. Introduction to Information Technology by V. Rajaraman, PHI Publication.
3. Information technology today By S. Jaiswal.
4. Fundamental of IT: Leon and Leon, Leon Tec World.
5. Introduction to Information Technology by Aksoy and DeNardis, Cengage Learning.

**MCA- 102**

**Computer Programming and Numerical Methods**

1. Introduction to C programming, Decision Making, Branching, Looping, Arrays & Strings, Functions and Pointers.
2. Algebraic Equation : Iterative Methods – Roots of a Single transcendental equations and roots of Polynomials using Bisection Method , False position Method , Newton Raphson Method.
3. Simultaneous Algebraic Equation :Gauss Elimination Method, Gauss-Jordan Method, Factorization Method, Jacobi's Iteration Method, Gauss- seidal Iteration Method. Matrix Inversion using Gauss Elimination and Gauss Jordan methods. Eigen Value and Eigen Vectors.
4. Interpolations: Newton Methods. Lagrange's Interpolation Formula and difference tables. Least Square Approximations- Linear regression only., Curve Fitting.
5. Differentiation and Integration- Formula for Numerical Differentiation and Numerical integration by Trapezoidal Rule and Simpson's rule only. Numerical Solution of Differential Equation :- Euler's Method, Taylor series Method, Runge Kutta Method.

**Readings**

1. Numerical Methods by B. S Grewal, Khanna Publishers, Delhi
2. Programming in ANSI C by E. Balguruswamy, Tata McGraw-Hill Education Pvt. Ltd
3. Numerical Methods By V. Rajaraman, 3rd Edition, Prentice-Hall India Pvt. Ltd.
4. Numerical Methods By S.S. Shastri, 4th edition, 2005, PHI publications.
5. LET US C By Y. Kanetkar, 14<sup>th</sup> Edition, BPB Publication.
6. Computer Based Numerical and Statistical techniques, P.K.Mittal and Mukesh B.,Galgotia Publication.

**MCA-103****Discrete Mathematical Structures**

1. **Mathematical Logic** : Notations, Algebra of Propositions & Propositional functions, logical connectives, Truth values & Truth table Tautologies & Contradictions, Normal Forms, Predicate Calculus, Quantifiers. **Set Theory**: Sets, Subsets, Power sets, Complement, Union and Intersection, De-Morgan's law Cardinality, relations: Cartesian Products, relational Matrices, properties of relations equivalence relation functions: Injection, Surjection, Bijection, Composition, of Functions, Permutations, Cardinality, the characteristic functions recursive definitions, finite induction.
2. **Boolean Algebra** : Truth values and truth tables, the algebra of propositional functions, boolean algebra of truth values Axiomatic definitions of Boolean algebra as algebraic structures with two operations, Switching Circuits.
3. **Groups** : Groups, axioms, permutation groups, subgroups, co-sets, normal subgroups.
4. **Graphs** : Simple Graph, directed graph, Degree of a Vertex, Types of Graphs, Sub Graphs and Isomorphic Graphs, Operations of Graphs, Path, Cycles and Connectivity, Euler and Hamilton Graph, Shortest Path Problems, BFS ,DFS, Dijkstra's Algorithm, Representation of Graphs, Planar Graphs, Applications of Graph Theory.
5. **Matrices** : Addition, subtraction, multiplication, transposes.

**Readings:**

1. A text book of Discrete Mathematics By Swapan Kumar Sarkar (S. Chand & company Ltd.).
2. Discrete Mathematical structure with Applications to computer science By J.P Trembly & R.P. Manohar.
3. Discrete Mathematics By K.A Ross and C.R.B writht.
4. Discrete Mathematics Structures By Bernard Kohman & Robert C. Bushy.  
for computer science
5. Discrete Mathematics By Seymour Lipschutz Mare Lipson. Tata McGraw-Hill Edition.

**MCA-104****Data Structure using C**

1. **Introduction to Data Structures:** Definition of Data structure and Abstract data type. Basics of Algorithm. Classification of Data structures: Linear, Non-linear. Arrays: Definition & types of array, Memory representation of one & two dimensional array, Operations on DS. Linked List: Singly Linked list- Operation on it; doubly linked list- Operation on it; Circular linked list - Operation on it.

Overview of C, loops, Functions: call by value and call by reference, Recursive function. Structure: Structure and applications of Structure in various DS. Pointer and applications of Pointer in dynamic memory allocation.

2. **Stacks, Queues:** Stacks; Array representation of stack; Linked representation of stack; Various polish notation's-Prefix, Postfix, infix; Evaluation of a postfix & Prefix expression; Conversion from one another; Application of stack; Queues; Linked representation of queues; Dqueues; Circular queue; Priority queue.
3. **Trees** :Binary trees; Types of binary tree Representation of binary tree in memory; traversing binary tree; Binary search trees; Searching and inserting in binary search trees; Deleting in a binary search ,tree; AVL search trees and operation on it . B trees: searching, insertion, deletion; Heap.
4. **Graphs** : Terminology & representation; Warshall algorithm; Shortest path; Minimum spanning tree; Kruskal & Dijkstara algorithm; Linked representation of graph; Operation on graph; Traversing a graph.
5. **Searching and Sorting:** Searching algorithm: linear search, binary search; sorting algorithms: Bubble sort, Insertion sort, Selection sort, Quick Sort, Merge sort and Heap sort.

**Readings:**

1. Programming in C “Yashwant Kanetkar”, BPB Publications,Tenth Edition.
2. The C Programming Language “Kemigham and Ritche [ Prentice Hall]”
3. Data Structure By Lipshutz, McGraw Hill.
4. Data Structure By Standish, Addison-Wesley.
5. Data structures Through C by G. S. Baluja.



**MCA-105****Computer Organization**

1. **Number System:** Binary, Octal and Hexadecimal number system, Conversion from one number system to another, Binary arithmetic, Representing negative numbers, BCD codes, ASCII codes, EBCDIC codes, Excess three code, Gray code, Floating point representation, 1's complement and 2's complement, Arithmetic representation of signed binary numbers, 9's complement and 10's complement system.
2. **Logic Gates and Boolean Algebra:** Properties and Symbolic Representation Of NOT, AND, OR, NOR, NAND, EX-OR, EX – NOR GATES, NOR and NAND GATES as a universal gates, Laws and identities of Boolean algebra, Demorgan's theorem, Use of Boolean algebra for simplification of logic expression, SOP and POS forms, Canonical forms, Maxterm, Minterm, Karnaugh map for 2,3,4 variable.
3. **Combinational and Sequential Circuits:** Multiplexer, De multiplexers, Decoders, Encoders, Half adder, Full adder, Half subtractor, Full subtractor, n-bit adder, Adder-subtractor, Flip flops, Registers, Counters.
4. **CPU Organization and Parallel Processing:** General register organization of C.P.U, Stack organization, Instruction format, Addressing modes, Parallel processing, Pipelining, Arithmetic pipelining, Instruction pipeline, RISC pipeline, Vector processing, Array processor.
5. **Memory Organization:** Memory hierarchy, Types of memory, Associative memory, Virtual memory, Cache memory.

**Readings:**

- 1.M. Morris Mano, Digital Design, 3.ed., Prentice Hall of India Pvt. Ltd., New Delhi, 2003/Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.
- 2.Donald P.Leach and Albert Paul Malvino, Digital Principles and Applications, 5d., Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
- 3.R.P.jain, Modern Digital Electronics, 3ed., Tata McGraw-Hill publishing company limited , New Delhi, 2003.
- 4.Carl Hamacher, Zvonko Vranesic and Safwat Zaky, 5th Edition "Computer Organization", McGraw-Hill,2002.
- 5.William Stallings, "Computer Organization and **Architecture** – Designing for Performance", 6<sup>th</sup> Edition, Pearson Education, 2003.
- 6.David A.Patterson and John L.Hennessy, "Computer Organization and Design: The hardware / software interface", 2nd Edition, Morgan Kaufmann, 2002

MCA-201

### Principles of Operating System

- 1. Introduction:** Definition, Design Goals, Types, Batch processing, Multi-programming, Real time, Time sharing; Functions of Operating System.
- 2. Process Management:** Process states, Process Control block, Schedulers, CPU Scheduling algorithms
- 3. Inter process synchronization and communication:** need, Mutual exclusion, semaphore, classical problems in concurrent programming, critical region and conditional critical region, Deadlock Characteristics, prevention, resource allocation graphs.
- 4. Memory Management:** Address Binding, Dynamic Loading and Linking Concepts, Logical and Physical Addresses, Contiguous Allocation, Fragmentation, Paging, Segmentation, Virtual Memory, Demand Paging, Page fault, Page replacement algorithms, Global Vs Local Allocation, Thrashing,
- 5. File and Secondary Storage Management:** File Attributes, File Types, File Access Methods, Directory Structure, File System Organization, Allocation Methods, Free Space management; Disk Structure, Logical and Physical View, Disk Head Scheduling, Formatting, Swap Management.  
UNIX/ LINUX/ WINDOWS/Android as an example of Operating systems

#### Readings:

1. Operating System Concepts 6/ed By Silberschatz and Galvin, Addison Wesley.
2. Operating Systems: Internals and Design Principles 5/ed By William Stalling, PHI.
3. Modern operating Systems By Tanenbaum, PHI.
4. Operating System Concepts By Peterson and Silberschatz, Addison Wesley.
5. Operating System Principles By P. B. Hansen, PHI.
6. The UNIX Operating System By K. Christian, John Wiley.

## MCA-202

**Object Oriented Programming with C++**

- 1. Principles of OOP:** Procedure oriented Vs Object oriented, OOP paradigm, Features of OOP ,Basic Data types Tokens, Keywords, Constant ,Variables, Operator I/O statements , Structure of C++ program, Arrays, pointers, Object modeling technique (OMT).
- 2. Function, Object and Class:** Defining class, Abstract class ,Function prototype, Function with parameter ,Passing object as a parameter, Constructor function ,Types of constructor, Destructor Friend function , Friend class, Dynamic allocation operator new and delete.
- 3. Polymorphism and Inheritance:** Types of polymorphism, Constructor overloading ,Operator overloading, Template function Template class, Types of inheritance ,Private ,protected and public derivation of class ,Resolving ambiguity Pointer to object, This pointer ,Virtual class , virtual function.
- 4. Input - output and File handling:** I/O classes ,File and stream classes ,Opening and closing file Detecting end of file, String I/O, Char I/O, Object I/O, I/O with multiple object ,File pointer, Disk I/O.
- 5. Exception handling, Name spaces and Standard Template library (STL):** Need of Exception handling ,try ,catch and throws keywords , defining namespace ,benefit of namespace, Component of STL.

**Readings:**

1. Object oriented programming with C++ by E.Balagurusamy II nd edition Tata Mc-Graw Hill.
2. Object Oriented Programmin By McGregor and Sykes S A, 1992 Van Nostrand.
3. The C++ Programming Language By Strustrp B,Addision Wasley.
4. Object Oriented Programming in C++ By Lafore R, Galgotia Publications.
5. Introduction to Object Oriented Programming By Witt KV, Galgotia Publications.
6. Object Oriented Programming By Blaschek G, Springer Verlag

## MCA-203

**Theory of Computation**

- 1 Theory of Automata:** Definition of an automaton, Transition system, Acceptability of a string by FA, Nondeterministic finite state machine, Designing of DFA and NFA ,Equivalence of DFA and NFA, Conversion of NFA to DFA, Minimization of finite automata, Mealy and Moore models, Minimization of finite automata.
- 2 Formal Languages, Regular Sets and Regular Grammars:** Definition, Languages and their relation, Chomsky classification of language, Regular expression, and Finite automaton, Pumping Lemma for regular sets, Application of Pumping lemma, Closure property of regular sets, Regular sets and regular grammar.
- 3 Context-free Language:** Context free language and derivation trees, Ambiguity in context free languages, Simplification of context free languages: (left recursion, Unit production elimination, Eliminating null values) Normal forms of context free languages.
- 4 Pushdown Automation:** Definition, Acceptance by PDA, Designing PDA, Push down automation and Context free languages, Parsing and Pushdown automata.
- 5 Turing Machine:** Turing Machines model, Representation of TM, Languages acceptability by TM, Design of TM, Introduction: Universal Turing Machines and Halting problem, Introduction: Linear bounded automata and languages.

**Readings:**

1. K L P Mishra “Theory of Computation”,3rd Edition PHI Publication.
2. J.E.Hopcroft, R.Motwani and J.D Ullman, “Introduction to Automata Theory, Languages and Computations”, Second Edition, Pearson Education, 2003
3. G.PSaradhiVarma and B. ThirupathiRao , “ Theory and Computation Formal Languages and Automata Theory”,2005, SCITECH publication.
4. H.R.Lewis and C.H.Papadimitriou, “Elements of The theory of Computation”, Second Edition, Pearson Education/PHI, 2003
5. J.Martin, “Introduction to Languages and the Theory of Computation”, Third Edition, TMH, 2003.

MCA-204

ELECTIVE-I

(1)

### Computer Networks

1. **Introduction and Physical Layer :Introduction:** Goal and application Network Hardware and Software, Protocol Hierarchies, Design Issue of the layers, Interfaces and services, Connection oriented and connection less services, Service Primitives, Reference Models – The OSI Reference model, The TCP/IP Model ,Types of computer Network :LAN,MAN,WAN, Topologies, Transmission mode .  
**Physical Layer :**Data and signal, Analog and digital Communication, Transmission Media ,Concept of data transmission, Switching Techniques ,Communication Satellites – Geosynchronous Satellite – VSAT, Low Orbit Satellites, ISDN and ATM.
2. **Data Link Layer :** Data Link Layer design issues Data link control:Framing, Flow control. Error Detection and Correction. DLC protocol :Stop and Wait Protocol, Sliding window protocol, A Simplex protocol for noisy channel, Medium access sublayer: Channel allocation :static and dynamic ,Multiple access protocol FDDI, Data Link Layer in the Internet : SLIP,PPP. Wired and Wireless LAN protocol.
3. **Network Layer :** The Network Layer Design Issue, IP addressing, Address mapping, Error reporting ,Multicasting ,Delivery, Forwarding and Routing. The Network Layer in the Internet : The IP Protocol. subnets, Internet control protocols ,internet multicasting.
4. **Transport Layer :**The Transport layer services, The concept of client and server in terms of socket addressing Quality of service, Transport service primitives and buffering, Multiplexing, Crash Recovery. The Internet Transport Protocols (TCP/IP) – The TCP Service Model, The TCP protocol, The TCP segment header, TCP connection management, TCP transmission policy, TCP congestion control, TCP timer management, UDP.
5. **Presentation and Application Layer :** Network Security, Traditional Cryptography, Private key cryptography and public key cryptography, Authentication protocols, DNS ,SNMP,E-mail, application layer protocols.

#### Readings:

1. Data Communications and Networking By Forouzan, Tata McGraw Hill Company.
2. Computer Networks By A.S. Tanenbaum
3. Computer Network By S.S.Shinde ,New Age International Publisher.
4. Data and computer Communication by Shashi banzal ,Firewall media
5. Internetworking with TCP/IP :Principles,protocols,and Architecture Vol 1 5<sup>th</sup> Edition ,PHI publication
6. Data Communications and Computer Network by Prakash C Gupta, PHI Publication.

**MCA-204 ELECTIVE-I (2)**

**System Analysis and Design**

1. System definition, Need for system development, Types of system, Types of user, System development strategies, SDLC, Feasibility study, Structured Analysis, Development Strategies, Physical and Logical DFD, Data Dictionary, System Prototype Method, Role of system analyst, System investigation :- Fact Finding Techniques, Tools for Documenting Procedure & Decision :Decision Tree, Decision Table, Structured English. Academic and personal qualification of a system analyst, the multifaceted role of the system analyst.
2. Cost benefit analysis: cost and benefits determination. The system proposal. File structure, file organization: sequential organization, indexed sequential organization, inverted list organization. Direct access organization. Database design: Objectives of database and role of database administrator.
3. Introduction to UML, OO Development Life cycle and Modelling, static and Dynamic modelling, Comparison of OO and Module-Oriented Approach, Modelling using UML.
4. System Implementation (System Testing & Quality Assurance) - Introduction, the Test Plan, Quality Assurance, Levels of Quality Assurance, Role of Data Processing Auditor.
5. Software Documentation- Requirement Documentation, Architecture/Design Documentation, Technical Documentation, User Documentation, Marketing Documentation, Documentation Standard, Online Documentation

**Readings:**

1. Edward,” System Analysis & Design “, Tata McGraw Hill, ISBN:8120317270
2. James, A.S, Analysis and design of information systems, Mc Graw hill, New York, 1997
3. ‘A’ Level *made simple* Structured System Analysis and Design, BPB publications: Dr.Madhulika Jain, Vineeta Pillai, Shashi Singh, Satish Jain
4. Effective Methods for Software Testing, William E. Perry
5. Venkata Rao,v., System Analysis, design & MIS,BPB publications, 2000
6. Awad, Elias., analysis and design, Galgotia publications pvt.Ltd.1998

**MCA-204                      ELECTIVE-I                      (3)**

### **Introduction to Microprocessor**

1. Introduction, Overview of microcomputer systems, General operation of a microcomputer, Microprocessor : their emergence from 8-bit, Decoder, encoders, Latches, Flipflops, Multiplexer, Demultiplexer.
2. Microprocessor History, 8085 Architecture and Register organization, Functional Block Diagram, Bus Organization, 8085 Instruction Set, Instruction classifications, Instruction word size, Instruction format, Addressing modes, Assembly Language programming,
3. Memory, I/O devices, Addressing memory and I/O devices, Memory mapping, Memory Interfacing, TriState Devices, Buffers.
4. Programming techniques with additional instructions: Looping, Counting, Indexing, Introduction to Advanced Instructions, Instruction cycle, Machine cycle, Timing Diagram, Stack and subroutine, Counter and Time delay, Debugging.
5. Interfacing Chips: 8255A (PPI), 8155 (Multipurpose Programmable Device), Interrupts, 8259A (PIC), Serial I/O and Data communication, Serial Data communication standard (RS 232C) 8257 or 8237A (DMA Controller), 8251A (USART). 16 bit processor 8086: Introduction, Architecture, Pin Diagram, Min & Max Mode, Addressing Modes.

#### **Readings:**

1. .Ramesh S. Gaonkar, —Microprocessor Architecture, Programming and Application with 8085, 5th edition, Penram International Publishing (India) Pvt. Ltd.
2. .D V Hall, —Microprocessor & Interfacing| McGraw Hill Education India
3. A. P. Mathur , —Introduction to Microprocessor| McGraw Hill Education India.
4. B.Ram, —Fundamentals of Microprocessor and Microcomputer| DhanpatRai& Co Publication.
5. P K Ghosh, P R Sridhar, —0000 to 8085 Introduction to microprocessor to Engineers & Scientists|Prentice-Hall of India.

MCA-205 ELECTIVE-II (1)

**Object Oriented Software Engineering**

1. **Software Engineering Paradigms:** Software Development process models. **Project & Process:** Project management, Process & Project metrics. **Fundamental concepts of object oriented programming:** Introduction to the principles of object-oriented programming (classes, objects, messages, encapsulation, inheritance, polymorphism, exception handling, and object-oriented containers). **Object Oriented Analysis:** Object Oriented Analysis, **Analysis Techniques:** Object Modeling, Dynamic Modeling, and Functional Modeling. Adding Operations, Analysis Iteration.
2. **Using UML:** UML Introduction. **Object Modeling Notations:** Basic Concepts. **Structural Diagram:** Class Diagram, Object Diagram, Component Diagram, Deployment Diagram. **Behavioral Diagrams:** Use Case Diagram, Interaction Diagram, Activity Diagram, Statechart Diagram. **Modeling with Objects. System Design, Object Design.**
3. **Object Modeling:** Objectives. **Advanced Modeling Concepts:** Aggregation, Abstract Class, Multiple Inheritance, Generalization and Specialisation, Meta Data and Keys, Integrity Constraints, **Dynamic Model:** Objectives, Events, State and State Diagram, Elements of a State Diagram, Advanced Concepts in Dynamic Modeling, **Functional modeling.**
4. **Patterns:** Benefits of patterns, using patterns during Analysis, using Pattern during Design.
5. **Object mapping with Database:** Objectives, Relational Database Schema for Object Modes, Object Classes to Database Tables, Mapping Associations to Tables, Mapping Generalizations to Tables, Interfacing to Databases.

**Readings:**

1. Bernd Bruegge & Allen H. Dutoit, "Object-Oriented Software Engineering", 2009.
2. Bertrand Meyer, Object Oriented Software Construction, Prentice-Hall.
3. Grady Booch, James Rumbaugh and Ivar Jacobson, Unified Modeling Language Guide, Addison-Wesley.
4. Ivar Jacobson, "Object-Oriented Software Engineering", Pearson Education, 2009.
5. Stephen R. Schach, "Object-Oriented Classical Software Engineering", Mc Graw Hill, 2010.
6. Yogesh Singh, "Object-Oriented Software Engineering", 2012
7. Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005



**MCA-205 ELECTIVE-II (2)**

### **Multimedia**

1. Introduction to Multimedia System Multimedia elements, Multimedia applications, Global structure, Technologies for Multimedia system. Multimedia: Media & Data Streams Multimedia: media & data streams, Properties, Traditional data stream characteristics, Data stream characteristics for continuous media, Information units.
2. Sound / Audio Sound Concepts, Music: MIDI Concepts, MIDI devices, MIDI messages, MIDI software, Speech: Speech generation, Speech Analysis, Speech Transmission. Image And Graphics Digital Image Representation, Image Formats, Graphics Formats, Image Processing: Image Synthesis, Image Analysis, Image Transmission.
3. Video & Animation Basic concepts, Television (Conventional systems, Enhanced definition systems, High Definition system), Computer based Animation.
4. Data Compression Storage space, Coding requirements, Source Entropy & Hybrid coding, Basic compression techniques, Introduction to following compression techniques: JPEG, H.261 (PX64), MPEG ,DVI
5. Optical Storage Media & Retrieval Technologies Basic Technology, Video Disk & other WORMS, CD ROM, CD ROM Extended Architecture, Compact Disk Magneto optical.

#### **Readings:**

1. Multimedia System Design By P. K. Andleigh, Kiran Thakrar.
2. Multimedia Computing Communication & Application. By Ralf Steinmetz, & Klaranashtedt. (Pearson Education).

**MCA-205 ELECTIVE-II (3)****Linux operating System and Shell Programming**

1. **INTRODUCTION TO LINUX:** History, The Linux Architecture, Features of Linux, Internal and External Commands, Command Structure, difference between Linux and Unix, various Linux distributions, basic commands. **UTILITIES:** file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, Text processing utilities and backup utilities, Security commands. The vi editor, security by file Permissions.
2. **INTRODUCTION TO SHELLS:** Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell Edition Environment Customization. Filters. **GREP:** Operation, grep Family, Searching for File Content. **SED:** Scripts, Operation, Addresses, commands, Applications. **AWK:** Execution, Fields and Records, Scripts, Operations, Patterns, Actions, Associative Arrays, String Functions, String Functions, Mathematical Functions, User – Defined Functions, Using System commands in awk, Applications.
3. **INTERACTIVE KORN SHELL:** Korn Shell Features, Two Special Files, Variables, Output, Input, Exit Status of a Command, eval Command, Environmental Variables, Options, Startup Scripts, Command History, Command Execution Process. **KORN SHELL PROGRAMMING:** Basic Script concepts, Expressions, Decisions Making Selections, Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.
4. **INTERACTIVE C SHELL:** C shell features, Two Special Files, Variables, Output, Input, Exit Status of a Command, eval Command, Environmental Variables, On-Off Variables, Startup and Shutdown Scripts, Command History, Command Execution Scripts. **C SHELL PROGRAMMING:** Basic Script concepts, Expressions, Decisions: Making Selections, Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.
5. **FILE MANAGEMENT:** File Structures, System Calls for File Management – create, open, close, read, write, lseek, link, symlink, unlink, stat, fstat, lstat, chmod, chown, Directory API – opendir, readdir, closedir, mkdir, rmdir, umask.

**Readings:**

1. Sumitabha Das, “Unix Concepts and Applications”, 4thEdition. TMH, 2006. (1, 2 units)
2. Behrouz A. Forouzan, Richard F. Gilbery, “Unix and shell Programming”, 1stEdition, Cengage Learning India, 2003.
3. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones,Wrox, Wiley India Edition.
4. Graham Glass, King Ables, “Unix for programmers and users”, 3rd Edition, Pearson Education, 2009.
5. N.B Venkateswarlu, “Advanced Unix programming”, 2ndEdition, BS Publications, 2010.
6. Yashwanth Kanitkar,” Unix Shell programming”, 1stEdition, BPB Publisher, 2010.
7. Linux: Complete Reference, 6th Edition, Richard Petersen, Tata McGraw-Hill

**MCA-301**

**Probability and Statistics**

1. **Descriptive measures** : Frequency distribution, mean, median, mode, standard deviation, moments, skewness and kurtosis, **Probability**: Definitions of Probability, Addition Theorem, Conditional Probability, Multiplication Theorem, Bayes' Theorem of Probability.
2. **Random Variables and their Properties**: Discrete Random Variable, Continuous Random Variable, Probability Distribution, Joint Probability Distributions Their Properties, Transformation Variables, Mathematical Expectations, Covariance.
3. **Probability Distributions**: Discrete Distributions: Binomial, Poisson Negative Binominal Distributions and their Properties; Continuous Distributions : Uniform, Normal, Exponential Distributions and their Properties.
4. **Multivariate Analysis and Curve Fitting**: Correlation, Correlation Coefficient, Rank Correlation, Linear Regression, Multiple Regression, Principles of Least Squares and Curve Fitting
5. **Estimation and testing of hypothesis**: Sample, Populations, Statistic, Parameter, Sampling Distribution, Standard Error, Un-Biasedness, Efficiency, Maximum Likelihood Estimator, Notion & Interval Estimation. Small Sample Tests. Large Sample Tests.

**Readings:**

1. Fundamentals of Mathematical Statistics, S. C. Gupta and V. K. Kapoor, Sultan Chand & Sons, 2002
2. Probability & Statistics for Engineers and Scientists, Walpole, Myers, Myers, Ye. Pearson Education.
3. Probability, Statistics and Random Processes, T.Veerarajan Tata McGraw – Hill
4. Probability & Statistics with Reliability, Queuing and Computer Applications, Kishor S. Trivedi, Prentice Hall of India ,1999

**MCA -302**

**Artificial Intelligence**

- 1. Introduction:** Definitions and approaches, Foundation of A.I. , Challenges in AI, Area and Applications of A.I., Intelligent Agents: meaning, types, environments, examples.
- 2. Problem Solving:** Problem solving as state space search, production system, writing production system and solution for a Water jug problem; some AI classical problems (statements only) cannibal missionaries, tower of Hanoi, tic tac toe, 8-puzzle, Search techniques: Breadth First, and Depth-first, Best-First Search, Hill-climbing, Heuristics, A\* algorithm, local and global maxima(minima),
- 3. Knowledge Representation and Reasoning:** Predicate and propositional logic, conversion of sentences to wffs of predicate logic, Resolution, clause form, Skolem functions, Unification, Resolution in Propositional and predicate logic, Semantic Nets.
- 4. Pattern Recognition:** Meaning of pattern, Pattern Recognition, Classification, Supervised & Unsupervised Learning of classifiers, K-NN, K-MEANS algorithms.
- 5. Expert Systems:** Introduction, Advantages, components and participants in an expert system, Application

**Readings:**

1. Artificial Intelligence: E. Rich and K. Knight, Tata McGraw Hill.
2. Artificial Intelligence: A New Synthesis By Nilsson, Morgan Kaufmann.
3. Pattern Classification 2nd Edition By R.O. Duda, Hart, Stork (2001) ,John wiley, New York.
4. Pattern Recognition : Technique and Applications By Shinghal (2006) ,Oxford University Press,New Delhi.

## MCA - 303

**Relational Data Base Management System**

1. **Overview of Database Management** :Data, Information and knowledge, Increasing use of data as a corporate resource, data processing verses data management, file oriented approach verses database oriented approach to data management; data independence, database administration roles, DBMS architecture, different kinds of DBMS users, importance of data dictionary, contents of data dictionary, types of database languages. Data models: network, hierarchical, relational. Introduction to distributed databases.
2. **Relational Model** : Entity - Relationship model as a tool for conceptual design-entities attributes and relationships. ER diagrams; Concept of keys: candidate key, primary key, alternate key, foreign key; Strong and weak entities, Case studies of ER modeling Generalization; specialization and aggregation. Converting an ER model into relational Schema. Extended ER features.
3. **Structured Query Language** :Relational Algebra: select, project, cross product different types of joins (inner join, outer joins, self join); set operations, Tuple relational calculus, Domain relational calculus, Simple and complex queries using relational algebra, stand alone and embedded query languages, Introduction to SQL constructs (SELECT...FROM, WHERE... GROUP BY... HAVING... ORDERBY....), INSERT, DELETE, UPDATE, VIEW definition and use, Temporary tables, Nested queries, and correlated nested queries, Integrity constraints: Not null, unique, check, primary key, foreign key, references, Triggers. Embedded SQL and Application Programming Interfaces.
4. **Relational Database Design** :Normalization concept in logical model; Pitfalls in database design, update anomalies: Functional dependencies, Join dependencies, Normal forms (1NF, 2NF, 3NF). Boyce Codd Normal form, Decomposition, Multi-Valued Dependencies, 4NF, 5NF. Issues in physical design; Concepts of indexes, File organization for relational tables, De-normalization.
5. **Introduction to Query Processing and Protecting the Database & Data Organizations** : Parsing, translation, optimization, evaluation and overview of Query Processing. Protecting the Data Base - Integrity, Security and Recovery. Domain Constraints, Referential Integrity, Assertion, Triggers, Security & Authorization in SQL.

**Readings:**

1. Database system concept By H. Korth and A. Silberschatz, TMH.
2. Data Base Management System By Alexies & Mathews , Vikas publication.
3. Data Base Management System By C. J. Date ,Narosha Pub.
4. Data Base Management System By James Matin .
5. Principles of Database System By Ullman.
6. An Introduction to database systems By Bipin Desai, 2011 ed.,Galgotia Publication.
7. Database Management System By A. K. Majumdar & P.Bhattacharya, TMH

**MCA-304                      ELECTIVE-III                      (1)**

### **Advanced Java Programming**

1. **Basics of Core JAVA:** class, interface, exception handling. **Collections :** Collection Interfaces, Concrete Collections, The Collections Framework      **Multithreading :** Creating thread and running it, Multiple Thread acting on single object, Synchronization, Thread communication, Thread group, Thread priorities, Daemon Thread, Life Cycle of Thread.
2. **Networking:** Internet Addressing, InetAddress, Factory Methods, Instance Methods, TCP/IP Client Sockets, URL, URL Connection, TCP/IP Server Sockets, Datagrams. **Java Database Connectivity (JDBC):** Merging Data from Multiple Tables: Joining, Manipulating, Databases with JDBC, Prepared Statements, Transaction Processing, Stored Procedures.
3. **Servlets:** Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle, Handling HTTP get Requests, Handling HTTP post Requests, Redirecting Requests to Other Resources, Session Tracking, Cookies, Session Tracking with HttpSession
4. **Java Server Pages (JSP):** Introduction, JavaServer Pages Overview, A First JavaServer Page Example, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries, **Enterprise Java Bean:** Preparing a Class to be a JavaBean, Creating a JavaBean, JavaBean Properties, Types of beans, Stateful Session bean, Stateless Session bean, Entity bean
5. **Remote Method Invocation:** Defining the Remote Interface, Implementing the Remote Interface, Compiling and Executing the Server and the Client, **Struts:** Basics of Struts, Struts : What and Why? , Model1                      vs                      Model2                      , Struts2                      Features, Steps to create Struts application , Understanding Action class , Understanding struts.xml file

#### **Readings:**

1. “Advanced Java 2 Platform HOW TO PROGRAM” by H. M. Deitel, P. J. Deitel, S. E. Santry – Prentice Hall
2. “Beginning Java™ EE 6 Platform with GlassFish 3 From Novice to Professional” by Antonio Goncalves – Apress publication

**MCA-304 ELECTIVE-III (2)****System Software**

1. **Basic Concepts:** Software, System Software, Types of system software, SIC (Simplified Instructional Computer), SIC/XE, Simple programs for SIC and SIC/XE
2. **Assemblers:** Assembler functions, M/C dependent assembler features, M/C independent assembler features, One-pass assembler, Multi-pass assembler, Implementation example- MASM assembler.
3. **Loaders and Linkers:** Introduction, Basic loader function, Machine dependent loader features, machine independent loader features, Loader design option.
4. **Macro processors:** Macro definition and expansion, Macro processor algorithm and data structure, Independent macro processor features, Macro processor design option.
5. **System software tools:** Software tools for program development, Editors, Debugging, Programming environment, User Interface.

**Readings:**

- 1 Leland L. Beck, System software-An Introduction to System Programming, 3rd Edition, Pearson Education, Asia, 2006.
- 2 D. M. Dhamdhare, System Programming & Operating Systems, Tata Mc Graw Hill, Second Revised Edition, 1999.
- 3 J. Donovan, Systems Programming: An Introduction to System Programming, Tata Mc Graw Hill Publication, Edition, 1999.
- 4 A. C. Shalini, System Software, Scitech Publications (INDIA) PVT, LTD, Fifth Reprint, 2010.

**MCA-304                      ELECTIVE-III                      (3)**

### **Neural Network**

1. **Introduction:** What is a neural network, benefits, model of a simple neuron, various components and their meaning used in the simple model of an artificial neuron
2. **Models of Neural Networks:** Single layer, multi layer perceptrons, types of transfer functions, recurrent networks , calculation of output in forward propagation in these networks, linearity and nonlinearity in models,
3. **Supervised and Back Propagation Networks:** Meaning of supervised learning with examples, Learning rules, errors and their calculations, learning in a neural network, training and testing of a neural network in prediction for single layer only, local minima, momentum, over-fitting in neural networks
4. **Unsupervised learning:** Meaning of supervised learning with examples and applications, learning with a teacher, Self Organized Feature Maps (SOFM), Kohonen Network learning and their examples
5. **Applications:** Neural Networks and their applications in classification, prediction, identification

#### **Readings:**

1. Neural Networks: A Comprehensive Foundation: Simon Haykin, Prentice Hall [2001 or later]
2. Neural Network Design: Hagan, Demuth, Beale, Thomson Learning, [2001 or later]
3. Introduction to Neural Networks Using MATLAB 6.0: Sivanadam, Sumathi, Deepa, The McGraw Hill [2006 or later]



MCA-305

ELECTIVE-IV (1)

### Web Technology

1. **Internet Concept:** Fundamental of Web ,History of Web, Web development overview, Domain Name System (DNS),DHCP,and SMTP and other servers ,Internet service provider (ISP), Concept of IP Address, Internet Protocol, TCP/IP Architecture ,Web Browser and Web Server.
2. **HTML and DHTML:-** HTML Tag, Rules of HTML, Text Formatting and Style, List, Adding Graphics to Html Document, Tables and Layout , Linking Documents, Frame, Forms, Project in HTML, Introduction to DHTML, CSS, Class and DIV, External Style Sheet.
3. **Scripting Languages:** Java Script (JS) in Web Page, Advantage of Java Script, JS object model and hierarchy ,Handling event, Operators and syntax of JS, JS Function, Client side JS Vs Server side JS ,JS security, Introduction to VB Script, Operator and Syntax of VB Script, Dialog Boxes, Control and Loop, Function in VBS.
4. **XML:**Introduction to XML, XML in Action, Commercial Benefits of XML, Gaining Competitive advantage with XML, Programming in XML, XML Schema ,XSLT ,DOM structure model ,XML quires and transformation.
5. **Active Server Page (ASP):** Introduction ,Internet Information System (IIS),ASP object ,Server object, File system object, session ,Accessing data base with an ASP page ,ODBC – ADO connection object, common methods and properties, ADO record set object .Introduction to ASP.Net.

#### Readings:

1. The complete Reference By Thomos A. Powell ,TMH publication
2. Web Technology :A Developers Perspective ,N.P.Gopalan ,J.Akilandeswani,PHI Publication.
3. Java Script :The definite Guide By Flangam , O'Reilly
4. Java Script :Developers Resource by Kamran Husain and Jason Levitt PTR-PHI publication.
- 5."Mastering VB Script" BPB Publication.
- 6.World Wide Web design with HTML by Xavier Tata McGraw Hill Publication .
7. XML By Example, Sean Mc Grath Pentice Hall Publication.
8. Web Technology : A Developments Perspective , N.P. Gopalan, J. Akilandeswari, PHI Publication

**MCA -305          ELECTIVE IV          (2)**

**Pattern Recognition**

1. **Pattern Concept:** Meaning of pattern, examples of patterns, importance of study of patterns in machine learning, meaning of labels, attributes, features, dimensions in patterns with examples, pattern recognition and classification, meaning of machine learning
2. **Pattern Recognition and classification:** Meaning and importance in machine learning, supervised and unsupervised learning with meaning and examples, classifiers, k-nn classification and k-means clustering, implementation and applications
3. **Decision Trees:** Meaning of tree and hence decision tree, building a decision tree, decision tree induction, classification using a decision tree, classification using ID3
4. **Evolutionary Computing:** Meaning of evolutionary computing, various operators used in evolutionary computing, genetic algorithms and their applications, Particle Swarm Optimization and their applications, Multi-objective Genetic Algorithms with examples
5. **Ensemble of classifiers:** Meaning and importance of ensembles, boosting and AdaBoost algorithm, bagging and random forest, weak and strong learning, ensembles of classifiers with voting

**Readings:**

1. Pattern Classification: Duda, R.O, Peter Hart, David Stork, 2010, Wiley India
2. Data Mining: Concept and Techniques, Morgan and Kaufmann, 2001
3. Pattern Recognition: Rajjan Shinghal, Oxford University Press New Delhi, 2006
4. Ensemble Methods, Foundations and Algorithms, Zhi-Hua Zhou, A CRC Press, Chapman and Hall Book, 2010
5. Pattern Recognition, Robi Polikar, Wiley Encyclopedia of Biomedical Engineering, 2006 John Wiley & Sons, Inc

**MCA-305                      ELECTIVE-IV                      (3)**

### **VB.NET Programming**

- 1. .Net framework and VB.Net:** Evolution of the .NET Framework – Overview of the .Net Framework – VB.NET – Simple VB.Net Program. **VARIABLES, CONSTANTS AND EXPRESSIONS:** Value Types and Reference Types – Variable Declarations and Initializations – Value Data Types – Reference Data Types – Boxing and Unboxing – Arithmetic Operators – Textbox Control – Label Control – Button Control.
- 2. Control Statements:** If Statements – Radio Button Control – Check Box Control – Group Box Control – Listbox Control – Checked List Box Control – Combo box Control – Select Case Statement – While Statement – Do Statement – For Statement. **METHODS AND ARRAYS:** Types of Methods – One Dimensional Array – Multi Dimensional Arrays – Jagged Arrays. **CLASSES:** Definition And Usage of a Class – Constructor Overloading – Copy Constructor – Instance and Shared Class Members – Shared Constructors.
- 3. Inheritance and Polymorphism:** Virtual Methods – Abstract Class and Abstract Methods – Sealed Classes. **INTERFACES, NAMESPACES AND COMPONENTS:** Definition of Interfaces – Multiple Implementations of Interfaces – Interface Inheritance – Namespaces – Components – Access Modifiers. **DELEGATES, EVENTS AND ATTRIBUTES:** Delegates – Events – Attributes – Reflection.
- 4. Exception Handling:** Default Exception Handling Mechanism – User Defined Exception Handling Mechanism – Throw Statement – Custom Exception. **MULTITHREADING:** Usage Of Threads – Thread Class – Start(), Abort(), Join(), and Sleep() Methods – Suspend() And Resume() Methods – Thread Priority – Synchronization. **I/O STREAMS:** Binary Data Files – Text Files - Data Files – FileInfo and DirectoryInfo Classes.
- 5. Additional Controls:** Timer – ProgressBar – LinkLabel – Panel – TreeView – Splitter – Menu – SDI & MDI – Dialog Boxes – Toolbar – StatusBar. **DATABASE CONNECTIVITY:** Advantages Of ADO.NET – Managed Data Providers – Developing a Simple ADO.NET Based Application – Creation of Data Table – Retrieving Data From Tables – Table Updating – Disconnected Data Access Through Dataset Objects.

#### Readings:

1. Muthu C. (2008), "Visual Basic.NET", 2nd Ed., Vijay Nicole Imprints Pvt.Ltd.,.
2. Jeffrey R.Shaprio (2002), "Visual Basic .NET The Complete Reference", Mac Graw Hill
3. Michael Halvorson (2010), "Visual Basic 2010 Step by Step", Microsoft Press.
4. Harold Davis (2002 ), "Visual Basic.NET Programming", Sybex.

## MCA 401

### Analysis & Design of Algorithm

1. **Introduction:** Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation-Big oh notation, Omega notation, Theta notation and Little oh and omega notation, recurrence relation: Substitution method, Master method

#### Deterministic Algorithms

2. **Divide and conquer:** General method, applications-Binary search, Quick sort, Merge sort.  
**Greedy method:** General method, Greedy knapsack problem, Minimum cost spanning trees: prim's and kruskal's algorithm, Single source shortest path problem: Dijkstra's Shortest Path Algorithm, Huffman coding.
3. **Dynamic Programming:** General method, applications-Matrix chain multiplication, Optimal binary search trees, , Longest Common Sub sequence Problem. **Back Tracking:** 8-queen problem, Graph Coloring, Hamiltonian Cycle, **Branch and Bound:** 0/1knapsack problem, travelling sales person problem

#### Non Deterministic Algorithms

4. **Interactable problems:** Basic concepts , non deterministic algorithms, NP-Hard and NP-Complete problems, Classes P and NP, Reducibility, Satisfiability Problem, Cook's theorem.  
**Approximation:** Graph Coloring, Task scheduling, bin packing, **Probabilistic algorithm :** Numerical integration, primality testing, **Graph Algorithms:** BFS and DFS and its applications.
5. **Evaluation of Algorithm**  
**Lower bound Techniques:** Lower bound techniques, Comparison Techniques, reduction.

#### Readings:

1. The Design and Analysis of Computer Algorithms , A.Aho, J. Hopcroft and J.Ullman, Addison Wesley.
2. Fundamentals of Computer Algorithms , E. Horowitz and S. Sahani, Galgotia, New Delhi.
3. Introduction to the Design and Analysis of Algorithms , S.E.Goodman and S.T.Hedetniemi, McGraw Hill.
4. Design Methods and Analysis of Algorithmics , G.Brassard and P.Bratley, PHI.
5. Design Methods and Analysis of Algorithms, S.K.Basu, PHI, 2005.
6. Introduction To Algorithms , Thomas H Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein ,MIT Press
7. Rosen, Kenneth , Discrete Mathematics and Its Applications , McGraw-Hill Science
8. W. W. Rouse Ball (1960) The Eight Queens Problem, in Mathematical Recreations and Essays, Macmillan, New York, pp 165-171.

## MCA 402

**Compiler Design**

1. **Basics of Compilers and Lexical Analysis:** Compilers and Translators, Bootstrap compiler, Phases of Compiler, Compiler writing tools, Bootstrapping, Overview of one pass compiler, Finite Automata, Basics of DFA, NFA, Regular sets and Regular expressions.
2. **Syntax analysis & Parsing techniques:** Basics of context free grammars and derivation of parse trees, Top down parsing and its implementation, Operator precedence parsing, Predicative top down parser, Bottom up parsing, Handling of right sentential form, LR parser, Canonical collection of sets, Construction of parsing action and GOTO table, Construction of LALR parsing table, Handling ambiguous grammar.
3. **Syntax directed definition and Translation:** L-attributed definition, Syntax directed translation scheme, Intermediate code generation, Representing three address statements, Syntax directed translation scheme to specify the translation of various programming language construct, Implementing increment and decrement operators, Array reference, Switch/case.
4. **Symbol table management & Error Handling:** Various approaches to symbol table organization, Representation of scope information in symbol table, Storage allocation activation of procedure and record, Static allocation and stack allocation. Error recovery, Error recovery in LR parsing, Predicative parsing error recovery.
5. **Code Optimization and Code Generation :** Introduction, Loop optimization, Eliminating induction variable, Eliminating local common sub expression, DAG, Eliminating global common sub expression, loop unrolling, loop jamming, Problems hindering code generation, Straight forward code generation, Using DAG for code generation, Peephole optimization.

**Readings:**

1. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman. "Compilers Principles, Techniques and Tools". Pearson Education, 2008.
2. O.G. Kakde, "Compiler Design", 2005, Laxmi Publication.
3. Adesh K. Pandey " Concepts of Compiler Design ", First Edition, S.K. Kataria & Sons Publication.
4. Steven S. Muchnick, "Advanced Compiler Design Implementation", Morgan Koffman, 1997.
5. Allen Holub, "Compiler Design in C", Prentice Hall of India, 1990.

**MCA-403**

**Optimization Techniques**

1. Introduction to OR, The Nature and Meaning of OR, History, Management Applications of OR , Principles, Characteristics, Scope of OR.
2. **Linear Programming**-Introduction and Applications of LP, Limitations of LP Formulation of a LP Model, Graphical Solution of a LPP, Simplex Method, Two Phase Method, Big-M Method, duality in LPP.
3. **Transportation Problem** – Introduction, Mathematical Formulation, Feasible Solution and Optimum Solution (simple case only).
4. **Assignment Problem** – Introduction, Mathematical Formulation, Traveling Salesman Problem, elementary Problems, Replacement Problems-Types, Simple Replacement Problems.
5. **Project Management by PERT-CPM** – Introduction, History & Applications, Basic Steps, Network Diagram Representation, Rules, Time Estimates and Critical Path in Network Analysis, Uses and Applications of PERT/CPM.

**Readings:**

1. Operations Research By H.A.Taha
2. Operations Research By V.K.Kapoor
3. Operation Research By S.D. Sharma

**MCA-404 ELECTIVE-V (1)**

**E-Commerce**

1. Introduction, Definition, Objectives, Advantages and disadvantages, Forces driving E-Commerce, Traditional commerce Vs. E-Commerce, E-Commerce opportunities for industries, Growth of E-Commerce.
2. E-Commerce Models: Business to consumer, Business to Business, Consumer to Consumer, other models – Brokerage Model, Aggregator Model, Info-mediary Model, Community Model and value chain Model.
3. Electronic Payment Systems: Special features required in payment systems, Types of E-payment systems, E-Cash, E-cheque, credit card, Smart Card, Electronic Purses.
4. E-Marketing, E-Customer Relationship Management, E-Supply Chain Management.
5. Security Issues in E-Commerce: Security risk of E-Commerce, Types of threats, Security tools and risk management approach. Cyber laws, Business Ethics, EDI Application in business.

**Readings:**

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

**MCA-404 ELECTIVE-V (2)**

**Financial Accounting**

1. Meaning and objects of accounting, Accounting Cycle, Accounting concepts and conventions, accounting equations, rules of journalizing, ledger posting.
2. Cash book, preparation of trial balance, trading and profit and loss account and balance sheet with adjustments relating to closing stock, outstanding expenses, prepaid expenses, Accrued income depreciation, Bad debts, provision for bad debts, provision for discount on debtors and creditors.
3. Basic concepts of cost accounting, elements of cost, classification of cost, preparation of cost sheet, inventory pricing, numerical through FIFO and LIFO methods.
4. Cost volume, profit analysis, standard costing computation of material and labor variances.
5. Budgetary control, preparation of cash budget and flexible budget, Zero base budgeting.

**Readings**

1. Chadwick, " The Essence of Management Accounting", PHI, India.
2. Subhash Sharma, "Management Control Systems (Text & Cases)", Tata McGraw Hill.
3. P. Sarvancel, " Management Control Systems"
4. Grewal, " Introduction to Book Keeping".
5. S.M. Shukla, Financial accounting, Sahitya Bhawan Publications,Agra.
6. M.L.agrawal ,Cost Accounting, Sahitya Bhawan Publications,Agra.
7. S.P.Gupta ,Management Accounting , Sahitya Bhawan Publications,Agra.



**MCA-404 ELECTIVE-V (3)**

### **Software Testing**

- 1. Fundamentals of Testing:** Human and errors, Testing and Debugging, Software Quality, Requirement Behavior and Correctness, Fundamentals of Test Process, Psychology of Testing, General Principles of Testing, Test Metrics.
- 2. Role of Testing in SDLC:** Review of software development models (Waterfall Models, Spiral Model, W Model, V Model) Agile Methodology and Its Impact on testing, Test Levels (Unit, Component, Module, Integration, System, Acceptance, Generic)
- 3. Approaches to Testing – I:** Static Testing ,Structured Group Examinations ,Static Analysis ,Control flow & Data flow, Determining Metrics
- 4. Approaches to Testing – II:** Dynamic Testing ,Black Box Testing ,Equivalence Class Partitioning, Boundary Value Analysis, State Transition Test, Cause Effect Graphing and Decision Table Technique and Used Case Testing.White Box Testing ,Statement Coverage, Branch Coverage, Test of Conditions, Path Coverage.
- 5. Test Management:** Test Organization ,Test teams, tasks and Qualifications ,Test Planning ,Quality Assurance Plan, Test Plan, Prioritization Plan, Test Exit Criteria ,Cost and economy Aspects ,Test Strategies, Test Activity Management, Incident Management.

#### **Readings:**

1. Software Testing Foundations, Andreas Spillner, Tilo Linz, Hans Schaefer, Shoff Publishers and Distributors
2. Software Testing: Ron Patton , Techmedia
3. Foundations of Software Testing by Aditya P. Mathur – Pearson Education custom edition 2000
4. Testing Object Oriented Systems: models, patterns and tools, Robert V Binder, Addison Wesley, 1996
5. Software Engineering – A practitioner’s approach by Roger S. Pressman, 5th Edition, McGraw Hill

**MCA-405                      ELECTIVE-VI                      (1)**

**Mobile Application Programming**

- 1. Introduction of Mobile Application:** Fundamentals of mobile applications, mobile Application environment and mobile operating Systems, IDEs and various Tools.
- 2. Introduction of Mobility and Building blocks of Mobile Application.:** Mobile Application development Activity life cycle, Mobile Landscape, Mobile Platforms, overview of various Mobile application tools.
- 3. Mobile Operating Systems:** Android library and its characteristic, iOS library and its characteristic, Windows Phone 7 library and its characteristic
- 4. App functionality based User interface and Mobile functions:** Application user Interface designing, User Interface Element, Menu, interaction among the activities. Threads, Asynchronous task, Service – states and life cycles, Notifications, Broadcast receivers, Telephony and SMS API, Animation API multimedia –Audio/Video playback and record, location aware etc.
- 5. Mobile Application development in Android:** Android Architecture -Android Stack –Linux Kernel, Android Runtime Environment Dalvik virtual Machine, Android Emulator. Basics Application creation and deployment in Android, Introduction of mobile application database SQLite.

**Readings:**

1. Professional Mobile Application Development, Jeff Mcwherter, Scott Gowell, Wrox Publisher, 1st Ed. 2012
2. Sams Teach Yourself Android Application Development in 24 Hrs, Lauren Darcy and Shane Conder, 1sted.
- 3:-Android Programming, Bill Philips and Brain Hardy.
- 4:Android Recipes : A problem-Solution Approach ,Dave Smith and Jeff friesen.

**MCA-405    ELCETIVE-VI    (2)**

### **C# and .NET Framework**

- 1. Introduction to C# :** Introducing C#, Understanding .NET, Overview of C#, Literals, Variables, Data types, Expressions, Branching, Looping, Methods, Arrays, Strings, Structures, Enumerations
- 2. Object oriented aspects of C#:** Classes, Objects, Inheritance, Polymorphism, Interfaces, Operator Overloading, Delegates, Events, Errors and Exceptions
- 3. Application Development on .NET:** Building Windows Applications, Accessing Data with ADO.NET
- 4. Web Based Application Development on .NET:** Programming Web applications with Web Forms, Programming Web Services
- 5. The CLR and the .NET Framework:** Assemblies, Versioning, Attributes, Reflection, Viewing Meta Data, Type Discovery, Reflecting on a type, Marshalling, Remoting, Understanding Server Object Types, Specifying a server with an Interface, Building a server, Building the Client, Using Single Call, Threads.

#### **Readings**

1. Programming in C#, E.Balagurusamy (Unit I, II)
2. Programming in C#, J. Liberty 2<sup>nd</sup> Edition – O'Reilly (Unit III, IV, V)

MCA-405                      ELECTIVE-VI                      (3)

### Cloud Computing

1. **Fundamental Cloud Computing**-Concepts, terminology, technologies, benefits, challenges, SLAs and business cost metrics associated with cloud computing, SaaS, IaaS, PaaS delivery models, common cloud deployment models, and cloud characteristics. Various applications of cloud computing.
2. **Cloud Architecture**: The technology architecture of cloud platforms and cloud-based solutions and services and their utilization via a set of cloud computing design patterns. hybrid cloud deployment models, compound design patterns, and solution architectures that span cloud and on-premise environments.
3. **Cloud Security & Governance**: **Cloud Security** :The cloud security mechanisms, A cloud security architecture. a set of security design patterns. **Cloud Governance** :the definition of cloud governance precepts, roles, practices, and processes, common governance challenges and pitfalls specific to cloud computing.
4. **Cloud Storage**: The cloud storage devices, structures, and technologies, cloud storage mechanisms, persistent storage, redundant storage, cloud-attached storage, cloud-remote storage, cloud storage gateways, cloud storage brokers, Direct Attached Storage (DAS), Network Attached Storage (NAS), Storage Area Network (SAN), various cloud storage-related design patterns.
5. **Cloud Virtualization& Microservices** : Core topic areas pertaining to the fundamental virtualization mechanisms and types used within contemporary cloud computing platforms are explored, along with various key performance indicators and related metrics. MicroServices of Cloud Computing.

### Readings

1. Distributed Computing by Dollymore Cloud Computing (Wind) by Dr. Kumar Saurabh, 2nd Edition, Wiley India
2. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley, 2011 Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012

**MCA-501**

**Soft Computing**

1. **Introduction** -What is soft computing, important soft computing techniques
2. **Artificial Neural Network** :Biological neural network Vs Artificial neural network, Neuron Model and Neural Network Architectures, ANN terminologies, ANN benefits, Supervised learning network :Error back propagation network, Perceptron learning (single layer only), Unsupervised learning network :Kohonen self organizing feature maps (SOM)
3. **Fuzzy Logic**-Crisp set Vs Fuzzy set, Operations on Fuzzy sets, Fuzzy relation, Membership function, Fuzzy arithmetic and Fuzzy measures
4. **Genetic Algorithm** – Introduction, representations of GA by binary and real-valued numbers, Genetic Operators and Parameters: Selection, crossover, mutation, elitism, Genetic Algorithms in Problem Solving
5. **Swarm Intelligence**: Meaning, Particle Swarm Optimization: basics, terminology, problem solving using PSO

**Readings:**

1. Principles of soft computing , S.N.Shivanandan and S.N. deepa Wiley India publication ,First Indian edition ,2008.
2. A Comprehensive Foundation to Neural Networks , Simon Haykins , Prentice Hall
3. Fuzzy Sets and Fuzzy Logic: Theory and Applications , G. J. Klir, and B. Yuan, PHI learning ,2011.
4. Dr.G.Canon, Fuzzy Logic and Fuzzy Decision Making: Concepts and Applications, Galgotia Publication.
5. D. E. Goldberg, Genetic Algorithms in Search, Optimization, and Machine Learning, Addison-Wesley, 1989.
6. Jang,Sun and Mizutani :Neuro-Fuzzy and soft computing :A computational Approach to learning and machine intelligence ,PHI learning ,2011.
7. N.K. Sinha & M. M. Gupta(Eds), Soft Computing and Intelligent Systems: Theory & Applications, Academic Press, 2000.

**MCA- 502**

**Computer Graphics and Multimedia**

- 1. Fundamentals of Computer Graphics:** Concepts and applications, Random and Raster scan devices, input-output devices: CRT, LCD, laser printer. Output primitives: Line drawing algorithm: DDA and Bresenham's; Circle generating algorithm: Bresenham's Midpoint algorithms, Ellipse: midpoint ellipse drawing algorithm. Antialiasing techniques: super sampling, pixel weighting, area sampling, pixel phasing Area filling: boundary fill algorithm, flood fill algorithm: Scan-line Polygon Fill Algorithm.
- 2. Transformation, viewing, Clipping:** 2-D Transformation: Translation, scaling, rotation, reflection, shear, matrix representation of all homogeneous coordinates, composite transformations. Two dimensional viewing: Viewing pipeline Window-to-view port transformation. Clipping operations: Line Clipping: Cohen Sutherland and Liang-barsky, Polygon Clipping: Cohen-Sutherland-Hodgeman and Weiler – Atherton Polygon clipping.
- 3. 3D Transformation, Visible Surface Detection and curves:** Visible Surface detection Algorithm: Object based and image based methods, depth comparison, A-Buffer, Back face removal, Scan-line method, Depth Sorting Method Area subdivision method. 3-D Transformation: translation, scaling, rotation, reflection. Three- dimensional object representations 3-D Viewing Projections – parallel and perspective projection. Curved lines and Surfaces: Spline representations, Interpolating and approximation curves, continuity conditions Bezier curves: concept and characteristics; B-Spline curves: concept and characteristics.
- 4. Color Models and Basic Concept of Animation:** Introduction of multimedia: Properties and applications, types of medium, data stream characteristics, Basic File and Data format: BMP, JPEG, GIF, TIFF. Color models: RGB, YIQ, CMY, HSV. Animation: Basic concept, animation languages, computer-based animation, methods of controlling animation, display of animation, animation techniques: onion skinning, motion cycling, masking, morphing, and transmission of animation, Multimedia Authoring tools.
- 5. Multimedia Systems:** Data compression: storage space, coding requirements. Source, entropy and hybrid coding some basic compression technique: runlength code, Huffman code. JPEG: Image preparation, Lossy sequential DCT –based mode, expanded Lossy DCT based mode, Lossless mode, and hierarchical mode. MPEG, Huffman Encoding, LWZ compression.

**Readings:**

- 1 Principles of interactive compo Graphics; W.M. Newman & Robert F Sproull.
- 2 Computer Graphics By Rogers TMH
- 3 Introductions to Computer Graphics Anirban Mukhopadhyay & Arup Chattopadhyay
- 4 Schaum's outlines -computer Graphics Mc Graw Hill International Edition.5
- 5 .Principles of Multimedia by Ranjan Parekh TMH
- 6 "Multimedia Systems Design", P. K. Andleigh & K. Thakrar, Prentice Hall Pvt. Ltd

**MCA-503**

**Data Mining and Data Warehousing**

- 1. Data Mining:** Meaning, necessity, steps, Normal searching Vs. knowledge extraction
- 2. Data Mining on different types of databases:** Relational, Data Warehouses, Transactional, Object oriented, Object relational, Spatial, Temporal and time series, Text and multimedia (i) Heterogeneous and legacy.
- 3. Data Warehouse:** Meaning, definition, OLTP Vs. OLAP, Data cube, star, snow flake, constellations, basic concepts in writing of DMQL, Three Tier Architecture, Indexing.
- 4. Data Preprocessing :** Noisy data, Inconsistent data, Data integration, Data transformation, Dimensionality reduction, Data compression.
- 5. Classification, Clustering and Prediction:** Meaning, Neural network based classification, k-nearest neighbourhood (kNN) classifiers, Clustering, Types of Clustering, Partitioning Method: k-means clustering, Prediction using Regression and Neural Network, Performance Measures.

**Readings:**

1. Data Mining: Concepts and Techniques, Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishes (Elsevier, 2<sup>nd</sup> edition), 2006
2. Data Mining Methods for Knowledge Discovery, Cios, Pedrycz, Swiniarski, Kluwer Academic Publishers, London – 1998.

### Big Data Analytics

1. **Understanding Big Data:** Datasets, Data Analysis, Data Analytics-Descriptive Analysis, Diagnostics Analytics, Predictive Analytics, Prescriptive Analytics, Big Data Characteristics – volume, velocity, variety, veracity, value, Different Types of Data – Structured Data, Unstructured Data, Semi-Structured Data
2. **INTRODUCTION HADOOP:** Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization.
3. **HADOOP ARCHITECTURE :** Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read, NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.
4. **Theory and methods for big data analytics:** Regression Modeling, Multivariate Analysis, Bayesian Modeling, Inference and Bayesian Networks, Support Vector and Kernel Methods, Analysis of Time Series: Linear Systems Analysis, Nonlinear Dynamics, Rule Induction, Decision Trees.
5. **Programming with R :** Basic Syntax, Data types, Variables, Operators, Decision Making, Loops, Functions, Vectors, lists, Matrices, Arrays, Data Frames, R Data Interfaces – CSV Files, Excel Files, Database, R charts & graphs , R statistics – Mean, Median, Mode, Linear Regression.

#### Readings:

1. Chris Eaton, Dirk deroos et al. , “Understanding Big data ”, McGraw Hill, 2012.
2. “Big Data Fundamentals: Concepts, Drivers & Techniques”, 1/e, 2016, Thomas Erl, Wajid Khattak, Paul Buhler, Prentice Hall.
3. “Big Data Analytics with R and Hadoop”, 1e, 2013, Vignesh Prajapati, Packt Publishing Ltd, UK.
4. “The Art of R Programming: A Tour of Statistical Software Design”, revised, 2011, Norman Matloff, No Starch Press
5. . "Hadoop:The Definitive Guide," 3/e, 2012, Tom White, O'REILLY Publications.
6. "Understanding Big Data: Analytics for Enterprise Class Hadoop and streaming Data" ,2012, Paul Zikopoulos, IBM, Chris Eaton, Paul Zikopoulos, The McGraw-Hill Companies.
7. "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications",2014, Bart Baesens, Wiley Publications .
8. “Mining of Massive Datasets”, 2012, Anand Rajaraman and Jeffrey David Ullman , Cambridge University Press



**MCA -504 ELECTIVE-VII (2)**

**Advanced Operating System**

1. Advanced Course in Operating System, Distributed Systems, Communication in distributed systems, processes and processors in distributed systems. Threads, systems Models, Process allocation, scheduling in distributed systems, fault tolerance, real-time distributed systems.
2. Theoretical issues in distributed systems: Logical clock, mutual exclusion, deadlock detection, agreement protocols, resource security and protection, concurrency control.
3. Distributed File System: Design and implementation, trends. Distributed shared Memory, consistency models, page-based distributed shared memory, shared variable distributed shared memory, object-based distributed shared memory.
4. Multiprocessor OS, Database OS: General features and theoretical issues.
5. Case Studies: Amoeba, Mach, chorus, DCE, etc. Multimedia Operating Systems: Process scheduling, File system, caching, Disk scheduling for multimedia.

**Readings**

1. A.S. Tanenbaum, Distributed Operating System, Prentice-Hall, 1995.
2. A.S. Tanenbaum, Modern Operating Systems, Pearson Education Asia, 2001.
3. M. Singhal and N. G. Shivaratri, , Advance Concepts in Operating Systems, McGraw-Hill, 1994.
4. J. W. S. Liu, Real-Time Systems, Pearson Education, 2000.

**MCA- 504 ELECTIVE-VII (3)****Parallel Processing**

- 1 Introduction to parallel processing:** Trends towards parallel processing; Parallelism in Uniprocessor systems: Basic Uniprocessor Architecture, Parallel Processing mechanisms, Multiprogramming and Time Sharing; Parallel Computer Structures: Pipeline computers, Array computers, Multiprocessor systems, Performance of Parallel Computers; Architectural classification schemes; Parallel processing applications.
- 2 Principles of Pipelining and Vector Processing:** Principles of Linear Pipelining, Classification of Pipelined processors, General pipelines & Reservation tables, Instruction and Arithmetic Pipelines: Design examples and principles of design, Vector Processing: characteristics, Multiple Vector Task Dispatching, Pipelined Vector Processing methods. Architecture of Cray-I.
- 3 Structure of Array Processors- SIMD Array Processors:** Organizations, Masking and Data Routing Mechanisms; SIMD Interconnection Networks: Static, Dynamic, Mesh-Connected, Cube Interconnection Networks, Shuffle Exchange, Omega Networks; Performance Enhancement methods; Associative Array processing: Associative Memory Organization, Associative Processors.
- 4 Multiprocessor Architecture:** Functional Structures – Loosely Coupled and Tightly coupled multiprocessors; Interconnection Networks for multiprocessors: Crossbar Switch and multiport memories, Multistage Networks for multiprocessors; Exploiting Concurrency for multiprocessors, Parallel Memory Organizations: High order & Low order interleaved memory; Multiprocessor Scheduling strategies, Interprocess communication mechanisms: Process Synchronization Mechanisms, Synchronization with Semaphores, Conditional critical section & monitors.
- 5 Algorithms on Array processors; Parallel Algorithms on Array Processors-** SIMD Matrix Multiplication, Parallel Sorting on Array Processors, SIMD Fast Fourier Transform, Parallel Algorithms of Multiprocessors-Classification of Parallel Algorithms, Synchronized Parallel Algorithms, Asynchronous Parallel Algorithms, Performance of Parallel Algorithms.

**Readings**

1. Computer Architecture & parallel Processing- Kai Hwang & A. Briggs (McGraw Hill)
2. Designing Efficient Algorithms for Parallel Computers – H.J. Quinns (McGraw- Hill)
3. Advanced Computer Architecture: parallelism, Scalability, Programmability- By:- Kai Hwang(TMh) 2. Computer Organization & Programming – By – Gear (TMh)
4. Parallel Processing for Supercomputers & Artificial Intelligence –By – Hwang & Degroo

**MCA -505 ELECTIVE-VIII (1)**

**Management Information System**

1. **Management Information System** : Definition, MIS as an evolving concept, MIS and other Academic Disciplines, Subsystems of an MIS.**Structure of MIS** : Elements of an Information System, MIS support for Decision making, MIS Structure and its different views.
2. **Hardware, Software, and communications** Technology for Information Systems.**System & Design** :Systems Development Initiative, Different Methodologies - Life Cycle & Prototype approach, Detailed study on Life Cycle Design & Implementation. Case Study.
3. **Managerial Decision Making** : Decision Making Process, Group Decision Support Systems,Architecture of GDSS, Categories of GDSS.
4. **Decision Support System** : Definition and Components of DSS (Data Base Management System,Model Base Management System, Support Tools), Applications of DSS, Functions of DSS.
5. **Planning and Control** : Definition of planning ,types , structure , Control definitions and its role in MIS.**A study of Computerization** in different functional areas of a typical manufacturing/business organization i.e Marketing, production, material, financial, personal.

**Readings**

1. Management Information Systems ,Gordon B. Davis & Margerethe H. Olson Mc-Graw-Hill.
- 2 Management Information Systems ,Kenneth, Prentice Hall Publication.
3. Management Information Systems , T. Lucey , Thomson Learning.

**MCA-505 ELECTIVE-VIII (2)**

**Network Security**

- 1. Foundations of Cryptography and security:** Security trends, The OSI Security architecture Security attack, services and mechanism, Ciphers and secret messages, Mathematical tools for cryptography: substitution techniques, modular arithmetic, Euclid's algorithm, finite fields, polynomial arithmetic.
- 2. Symmetric Cipher:** Symmetric cipher model, Design Principles of Block Ciphers, Theory of Block Cipher Design, Feistel cipher network structure, Data Encryption Standard (DES), Strength of DES Triple DES ,Modes of operation.Advance encryption Standard (AES)- Evaluation criteria of AES,AES cipher ,key distribution.
- 3. Public Key cryptography and Hash function:** Prime numbers and testing for primality, factoring large numbers, Principles of public key cryptosystem, RSA algorithm. Key management: Diffie-Helman Key exchange, Hash and Message authentication Code (MAC), Hash and MAC algorithms, Digital signature.
- 4. IP and Web security protocols:**Authentication application: Kerberos, Public key infrastructure .E-mail: Pretty Good Privacy (PGP), S/MIME. IP security, Web Security: Secure Socket layer (SSL) and Transport layer security, Secure Electronic Transaction (SET).
- 5. System Security:** Firewall, and Intrusion Detection system (IDS), Malicious Software.

**Readings**

- 1 . Cryptography and Network Security By William Stallings, 4<sup>th</sup> Edition Pearson Publication
2. Applied cryptography - protocols and algorithm By Bruce Schneier, Springer Verlag 2003
3. Cryptography and Network Security By Atul Kahate , TMH Publication.
4. Cryptography and Network Security By Behrouz A. Forouzan, First Edition, TMH Publication.
5. Network Security:Private Communication in Public World By Charlie Kaufman,Radia Perlman and Mike Speciner ,PHI Publication.

**MCA-505 ELECTIVE-VIII (3)****Digital Image Processing**

1. **Digital Image Processing (DIP):** Introduction, examples of fields that use DIP, fundamental steps in DIP, components of an image processing system. **Digital Image Fundamentals:** elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels.
2. **Image Transforms:** Two-dimensional (2D) impulse and its shifting properties, 2D continuous Fourier Transform pair, 2D sampling and sampling theorem, 2D Discrete Fourier Transform (DFT), properties of 2D DFT. **Other transforms and their properties:** Cosine transform, Sine transform, Walsh transform, Hadamard transform, Haar transform, Slant transform, KL transform.
3. **Image Enhancement: Spatial domain methods:** basic intensity transformation functions, fundamentals of spatial filtering, smoothing spatial filters (linear and non-linear), sharpening spatial filters (unsharp masking and high boost filters), combined spatial enhancement method. **Frequency domain methods:** basics of filtering in frequency domain, image smoothing filters (Butterworth and Gaussian low pass filters), image sharpening filters (Butterworth and Gaussian high pass filters), selective filtering.
4. **Image Restoration:** Image degradation/restoration, noise models, restoration by spatial filtering, noise reduction by frequency domain filtering, linear position invariant degradations, estimation of degradation function, inverse filtering, Wiener filtering, image reconstruction from projection.
5. **Image Compression: Fundamentals of data compression:** basic compression methods: Huffman coding, Golomb coding, LZW coding, Run-Length coding, Symbol based coding.

**Readings**

1. Gonzalez and Woods: Digital Image Processing, Pearson Education.
2. Anil Jain: Fundamentals of Digital Image Processing, PHI Learning.
3. Annadurai: Fundamentals of Digital Image Processing, Pearson Education.
4. Sonka, Hlavac and Boyle: Digital Image Processing and Computer Vision, Cengage Learning.
5. Chanda and Majumder: Digital Image Processing and Analysis, PHI Learning.
6. Jayaraman, Esakkirajan and Veerakumar: Digital Image Processing, TMH.
7. William K. Pratt, Digital Image Processing, Wiley India.

**MCA- 601**

**MAJOR PROJECT**

## GUIDELINES FOR PROJECT WORK (MCA)

A project report has to be submitted as per the rules described. Some additional guidelines regarding the Project Report are:

### Number of Copies:

**The student should submit One hardbound copy of the Project Report with one RW/CD/DVD.**

### Acceptance / Rejection of Project Report:

The student must submit a project report to the Head of Department/Project Guide for approval. The Head of Department/Project Guide holds the right to accept the project or suggest modifications for resubmission.

### Format of the Project Report :

The student must adhere strictly to the following format for the submission of the Project Report **a. Paper**

The Report shall be typed on white paper, A4 size or continuous computer stationary bond, for the final submission. The Report to be submitted to the University must be original and subsequent copies may be photocopied on any paper.

### b. Typing

The typing shall be of standard letter size, double-spaced and on one side of the paper only, using black ribbons and black carbons.

### c. Margins

The typing must be done in the following margins

Left ----- 35mm,      Right ----- 20mm

Top ----- 35mm,      Bottom ----- 20mm

### d. Binding

The Report shall be Rexene bound in black. Plastic and spiral bound Project Reports not be accepted. **e. Front Cover:**

The front cover should contain the following details:

**TOP** : The title in block capitals of 6mm to 15mm letters.

**CENTER** : Full name in block capitals of 6mm to 10mm letters.

**BOTTOM** : Name of the University, year of submission- all in block capitals of 6mm to 10mm letters on separate lines with proper spacing and centering. **f. Blank Sheets**

At the beginning and end of the report , two white black bound papers should be provided, one for the purpose of binding and other to be left blank.

### Abstract

Every report should have an Abstract following the Institute's Certificate. The abstract shall guide the reader by highlighting the important material contained in the individual chapters, section, subsection etc.

The report should contain the following:

Certificate from Company

Institute Certificate: Successful completion of project by competent authority.

Acknowledgments

Abstract

List of

Figures

Tables

Nomenclature and Abbreviations

## **Contents of the Project Report**

- 1. Company Profile (only for M.I.S. projects)**
  - 2. Introduction to the project**
  - 3. Scope of work.**
  - 4. Existing System and Need for System.**
  - 5. Operating Environment - Hardware and Software.**
  - 6. Proposed System.**
    - 6.1 Objectives to be fulfilled**
    - 6.2 User Requirements**
    - 6.3 Requirements Determination Techniques and Systems Analysis Methods Employed.**
    - 6.4 Prototyping.**
    - 6.5 System Features**
      - Design of Input
      - Design of Output screens and reports -  
Module specifications
      - D.F.D.'s and ER's -  
System flow charts -Data  
Dictionary -Structure  
charts -Database /File  
layouts -User Interfaces -  
Coding system
      - Design of Control Procedures -  
Design of Exception Handling
  - 7. Testing procedures and Implementation Phases**
  - 8. Acceptance Procedure**
  - 9. Post-Implementation Review**
  - 10. User Manual**
    - Menu explanation -  
User guide
    - Expected problems/errors and their solutions
  - 11. Problems encountered**
  - 12. Drawbacks and Limitations**
  - 13. Proposed Enhancements**
  - 14. Conclusions**
  - 15. Bibliography**
- Annexure:**
- Sample documents (manual or computer generated) -
  - Source code listing in a separate file
  - Output reports



**List of Tables:**

The Contents shall be followed by a 'List of Tables' indicating the table number, table title and the corresponding page number(s). The table number shall be in decimal point notation indicating the chapter number and the table number in that chapter.

NOTE : Any reference within the text shall be given by quoting relevant number. eg: 'Table5.2'

**List of Figures:**

The 'List of Figures, shall follow the 'List of Tables' indicating the figure numbers, figure titles and corresponding page number. The figure numbers shall be in decimal point notation.

**Nomenclature and Abbreviations:**

The 'Nomenclature and Abbreviations' shall follow the 'List of Figures' and contain the list of symbols and abbreviations and their long names used. The nomenclature should be given for ER's, DFD's, STRUCTURED CHARTS, and RUN CHARTS and for all other symbols in the techniques used. The nomenclature for every technique should appear on a separate sheet. As far as possible, accepted standard symbols shall be used.

**Chapter Numbering:**

The Chapters shall be numbered in Arabic numerals. Section and subsections of any chapters shall be in decimal notation. All chapters shall begin on a new page. The titles for the chapters and the title shall be properly centered at the top of the page and have three spaces between them.

**Company Profile:**

This chapter should highlight the company details. This would be chapter 1 and should include the main stream activity of the company, the product line of the company and the details of the department where the student was working. This should not exceed two pages or 800 words.

N.B. : Only relevant for M.I.S. Projects.

**Introduction:**

The 'Introduction' shall highlight the purpose of project work It will also define the chapters to be followed in the Project Report.

**Existing System and the Need for the System:**

If there is some system already in use, then a brief detail of it must be included, to help the examiner understand the enhancements carried out by the student in the existing system. Based on this, the student should exemplify the need for the computerization should be given.

N.B. : Only where relevant.

**Proposed System :**

**1. Objectives** : Clearly define the objective(s) of the system in a few lines.

**2. User Requirements** : State the requirements of the use in an unambiguous manner.

**3. Requirements Determination Techniques and System Analysis Methods Employed:**

Use the formal methods to describe the requirements of the use. Like Fact Finding Methods, Decision Analysis, Data Flow Analysis etc.

**4. Prototyping** : If the prototypes has been developed prior to the detailed design , then give details of the prototype.

**5. System Features :**

**5.1 Design of Input** :Inputs, Data Dictionary, Screens.

**5.2 Design of Output** :Outputs, Reports etc.

**5.3 Design of Control Procedures** : Structured charts, Module Specifications, Run charts etc.

**5.4 Design of Exception Handling** : Error handling and recovery procedures.

The choice of including topics in this chapter entirely depends on the student. The freedom given for this chapter is obvious.

Students will be working on various types of projects. A typical M.I.S. development project must include DFD's and structured charts etc. Thus a student is allowed to employ the techniques of his/her own choice suitable to his/her work. However, there is a guideline that the student must employ the techniques taught during the MCA course.