# Master of Computer Application (MCA)

**Course Code and Detail**

| Semester | Paper No. | Course Code | Title of Course | Credits | Compulsory/Elective |
|---|---|---|---|---|---|
| First Semester | **Compulsory Core Course** | | | | |
| | 3011 | MCA-01 | Discrete Mathematics | 4 | **Compulsory** |
| | 3012 | MCA-02 | Problem Solving and Programming through C | 4 | |
| | 3013 | MCA-03 | Computer Organization and Assembly Language Programming | 4 | |
| | 3014 | MCA-04 | Lab-1 (Based on MCA 02) | 4 | |
| | **Discipline Centric Elective Course** | | | | |
| | 3015<br>OR<br>3016 | MCA-E1<br>OR<br>MCA-E2 | Computer Architecture<br>OR<br>Microprocessor and its Applications | 4<br>OR<br>4 | **Elective** |
| **Credits of First Semester** | | | | **20** | |
| Second Semester | **Compulsory Core Course** | | | | |
| | 3017 | MCA-05 | Object oriented Programming with C++ | 4 | **Compulsory** |
| | 3018 | MCA-06 | Database Management System | 4 | |
| | 25078 | MCA-07A | Computer Fundamental and its organization | 4 | |
| | 3020 | MCA-08 | Lab-2 (Based on C++) | 4 | |
| | **Discipline Centric Elective Course** | | | | |
| | 3021<br>or<br>3022 | MCA-E3<br>OR<br>MCA-E4 | Data Warehouse and Mining<br>OR<br>System Analysis and Design | 4<br>OR<br>4 | **Elective** |
| **Credits of Second Semester** | | | | **20** | |
| Third Semester | **Compulsory Core Course** | | | | |
| | 3023 | MCA-09 | Software Engineering | 4 | **Compulsory** |
| | 3024 | MCA-10 | Data Communication and Computer Networks | 4 | |
| | 3025 | MCA-11 | Java Programming | 4 | |
| | 3026 | MCA-12 | Lab-3 (Based on Java Programme) | 4 | |
| | **Discipline Centric Elective Course** | | | | |
| | 3027<br>OR<br>3028 | MCA-E5<br>OR<br>MCA-E6 | Mobile Computing<br>OR<br>Parallel Computing | 4<br>OR<br>4 | **Elective** |
| **Credits of Third Semester** | | | | **20** | |
| Fourth Semester | **Compulsory Core Course** | | | | |
| | 3029 | MCA-13 | Theory of Computation | 4 | **Compulsory** |
| | 3030 | MCA-14 | RDBMS | 4 | |
| | 3031 | MCA-15 | Operating System Concepts | 4 | |
| | 3032 | MCA-16 | Lab-4 (Based on Oracle/REBM) | 4 | |
| | **Discipline Centric Elective Course** | | | | |

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|---|---|---|---|---|---|
| | 3033<br>OR<br>3034 | MCA-E7<br>OR<br>MCA-E8 | Artificial Intelligence<br>OR<br>Embedded System | 4<br>OR<br>4 | **Elective** |
| | **Foundation Course (Non Credit)** | | | | |
| | 2703 | PGFHR | Human Right and Duties | Non Credit | **Elective** |
| **Credits of Fourth Semester** | | | | **20** | |
| Fifth Semester | **Compulsory Core Course** | | | | |
| | 3035 | MCA-17 | Unix Shell Programming | 4 | **Compulsory** |
| | 3036 | MCA-18 | Numerical and Statistical Computing | 4 | |
| | 3037 | MCA-19 | Design and Analysis of Algorithm | 4 | |
| | 3038 | MCA-20 | Lab-5 (Based on Unix Shell programming) | 4 | |
| | **Discipline Centric Elective Course** | | | | |
| | 3039<br>OR<br>3040 | MCA-E9<br>OR<br>MCA-E10 | Computer Graphics<br>OR<br>Operational Research | 4<br>OR<br>4 | **Elective** |
| **Credits of Fifth Semester** | | | | **20** | |
| Sixth Semester | **Compulsory Core Course** | | | | |
| | 25079 | MCA-21(L) | Lab Based on MCA-23 (Web Technology) | 4 | **Compulsory** |
| | 25080 | MCA-22 | Probability and Distribution | 4 | |
| | 25081 | MCA-23 | Web Technology | 4 | |
| | 25082 | MCA-24 | System Software | 4 | |
| | **Discipline Centric Elective Course** | | | | |
| | 3042<br>OR<br>3043 | MCA-E 11<br>OR<br>MCA-E 12 | Object Oriented Analysis And Design<br>OR<br>Information and Network security | 4<br>OR<br>4 | **Elective** |
| **Credits of Six Semester** | | | **20** | | |
| **Total Credits** | | | | **120** | |

## MCA-01(Discrete Mathematics)

**Elementary Logic**

**Propositional Calculus:** Propositions, Logical Connectives, Logical Equivalence, Logical Quantifiers.

**Methods of Proof:** What is a proof? Different Methods of proof and Direct proof, Indirect proofs), Principle of induction.

**Boolean algebra and Circuits:** Boolean Algebras, Logic circuits, Boolean Functions.

**Basic Combinatorics**

**Sets, Relations and Functions:** Introducing Sets, Operations on sets, Relations, Functions.

**Combinatorics – An Introduction:** Multiplication and addition Principles, Permutations (Permutation of objects Not Necessarily distinct, circular permutation), Combinations, Binomial Coefficients, Combinatorial probability.

**Some More Counting Principles:** Pigeonhole principle, Inclusion – Exclusion Principle, Applications of inclusion exclusion.

**Partitions and Distributions:** Integer partitions, Distributions, distinguishable objects into Distinguishable Containers, Distinguishable objects into Indistinguishable containers, Indistinguishable objects into Distinguishable Containers, Indistinguishable objects into Indistinguishable Containers.

## MCA-02 (Problem Solving and Programming through C)

**An Introduction to C**

**Problem solving:** Problem solving Techniques, Design of Algorithms, Analysis of Algorithm efficiency, Analysis of Algorithm Complexity, Flowcharts.

**Basics of C:** History of C, Salient features of C, Structure of a C Program, Compiling a C Program, Link and Run the C Program, Diagrammatic Representation of Program execution process.

**Variables and Constants:** Character set, Identifiers of Keywords, Data types and storage, Data type Qualifiers, Variables, Declaring variables, Constants, Symbolic Constants.

**Expressions and Operators:** Assignment Statement, Arithmetic operators, Relational Operators, Logical operators, Comma and Conditional Operators, Type Cast operator, Size of Operator, C shorthand, priority of operators,

**Control Statements, Arrays and Functions**

**Decision and Loop Control Statements:** The if statement, the switch statement, the while loop, the do... while Loop, The for loop, The Nested Loops, The goto statement, The break statement, The continue statement.

**Arrays:** Array Declaration, Initialization, Subscript, Multi- dimensional Arrays.

**Strings:** Declaration and Initialization of Strings, Display of Strings, using different formatting Techniques, Arrays of Strings, Built in String functions and Applications.

**Functions:** Definition of a function, Declaration of a function, Function prototypes, the return statement, Types of variables and storage classes, Types of function invoking, call by value, Recursion.

**Structures, Pointers and File Handling**

**Structures and Unions:** Declaration of Structures, Accessing the Members of a structure, Initializing structures, Structures as function Arguments, Structures and Arrays, unions.

**Pointers:** Pointers and their characteristics, the address and Indirection operators, Pointer type, Declaration and Assignment, Pointer Arithmetic, Passing Pointers to functions, Arrays and pointers, Arrays of Pointers, Pointers and strings.

**The C Preprocessor:** #define to implement Constants #define to create, functional Macros, conditional selection of Code using # if def. Predefined Names Defined by pre-processors, Macros vs Functions.

**Files:** File Handling in C using File pointers, Input and output using file pointers, string, input/output Functions, Formatted input/output Functions, Block input/output Functions, Sequential vs. Random Access Files, Positioning the file Pointer, the buffered I/O – The UNIX like file routines.

## MCA-03 (Computer Organization and Assembly Language Programming)

**Introduction to Digital Circuits**

**The Basic Computer:** The Von Neumann Architecture, Instruction Execution, Instruction Cycle, Computers: Then and Now. Data Representation Number Systems, Decimal Representation in Computers, Alphanumeric Representation, Data Representation for Computation. Principles of Logic Circuits I Logic Gates, Logic Circuits, Combinational circuit (Address, Decoders, Encoders, ROM) Principles of Logic Circuits – II Sequential Circuits (Definition) Flip Flops(BasicFlip-Flops,ExcitationTables,MasterslaveFlip-Flop,Edge-TriggeredFlip-Flops), Sequential circuit Design (Registers, Counters Asynchronous Counters, synchronous counters, RAM) Design of a sample counter.

**Basic Computer Organization**

**The Memory System:** The Memory Hierarchy RAM, ROM, DRAM, FLASH Memory Secondary Memory and characteristics, Raid and its Levels, The concepts of High speed Memories, virtual memory, SIMM, DIMM. The input /Output System Input/output Devices, The input/output Interface, The Device Controllers and its structure, Device Drivers, Input – Output Techniques, Input Output Processors,

**External Communication Interfaces**

**Secondary Storage Techniques:** Secondary Storage Systems, Hard Drives, Removable Storage options. The I/O Technology: Keyboard, Mouse, Video Cards, Monitors (Cathode Ray Tubes, DPI, Interlacing, Bandwidth, Liquid Crystal Displays, Digital Camera, Sound Cards, Printers, Modems, Scanners, Power Supply. The Central Processing Unit, Instruction Set Architecture, Instruction set characteristics, Instruction set Design Considerations, Addressing Scheme (Immediate Addressing, Direct Addressing, Indirect Addressing, Register Addressing, Register Indirect Addressing, Indexed Addressing Scheme, Base Register Addressing, Relative Addressing Scheme, Stack Addressing), Instruction set and Format Design issues (MIPS 2000, Instruction Format), Registers Micro-Operations and Instruction Execution, Basic CPU Structure, Register Organization, General Registers in a processor, Micro-operation Concepts.

**Instruction Executions, Instruction Pipelining**

**ALU Organization:** ALU Organization, Arithmetic Processors

**The Control Unit:** The Control unit, the Hardwired Control, Wilkes Control, The Micro-programmed Control, The Micro instructions, The Execution of Micro Program Reduced Instruction set Computer Architecture Instruction to RISC, RISC Architecture, The use of Large

register file, Comments on RISC, RISC pipelining.

**Assembly Language Programming**

**Microprocessor Architecture:** Microcomputer Architectures, Structure of 8086 CPU, Register set of 8086, Instruction set of 8086, Addressing modes.

**Introduction to Assembly Language Programming:** The Need and use of the Assembly language, Assembly program, Execution, An Assembly program and its components, Input/output in Assembly program, The types of Assembly programs.

**Assembly language programming (Part-I):** Simple Assembly programs, Programming with Loops and Comparisons, programming for Arithmetic and String operations.

**Assembly language programming (Part-II):** Use of Arrays in Assembly, Modular Programming, Interfacing, Assembly language Routines to High level language programs, Interrupts, Device Drivers in Assembly.

## MCA-E1 (Computer Architecture)

- Introduction to parallel processing
- Memory and input-output subsystems
- Principles of pipelining and vector processing
- Pipeline computers and vectorization methods
- Structures and algorithms for array processors
- SIMD computers and performance enhancement
- Multiprocessor architecture and programming
- Multiprocessing control and algorithms
- Example multiprocessor systems
- Data flow computers and VLSI computations.

Reference Book: Computer Architecture and Parallel Processing.

By Kai Hwang (McGraw-Hill Education)

## MCA-E2 (Microprocessor and its Applications)

- Architecture and Pin Details of the 8085 Microprocessor
- Programming the Microprocessor-I
- Programming the Microprocessor-II
- Programming Exercises
- Interfacing Input and Output Devices
- Interrupts
- Memory in a Microprocessor Based System
- Programmable Peripheral Interface-8255
- Keyboard and Display Interface-8279
- Serial Communication Interface-8251
- Priority Interrupt Controller-8259
- Direct MemoryAccess-8257.
- Microprocessor Based Applications
- Other 8 Bit Microprocessors
- 16 Bit Microprocessors

Reference Book: Microprocessor and its Applications

By R. Theagarajan (New Age International Publication)

## MCA-05 (Object Oriented Programming with C++)

**An Introduction to Object Oriented Programming**

**Object Oriented Programming:** OOP Paradigm, the soul of OOP, OOP characteristics, Advantages of OOP, Applications of object Oriented Programming (System software, DBMS, Applications of OODBMS, Advantages and Disadvantages of OODBMS), The Object Orientation, OO Languages, Advantages of C++.

**Object Oriented Programming System:** What is OOPS?, Class, Inheritance, Abstraction (Procedural language, Object-oriented language), Mechanisms of Abstraction, Encapsulation and information hiding, Polymorphism, overloading,

**Advancedconcepts:**Dynamism(DynamicTyping,DynamicBinding,LateBinding,Dynamic Loading, Structuring programs, Reusability, Organizing Object-oriented Projects (Large scale designing, Separate Interface and Implementation, Modularizing, Simple Interface, Dynamic decisions, Inheritance of Generic Code, Reuse of tested code.

**IntroductiontoObjectOrientedLanguages:**Objective-C,Featuresofobjective-C,Python, Features of Python, C # (C SHAR), Features of C#, Eiffel, Modula-3, Features of modula-3, Small talk, object REXX, Java, Features of Java(Object Oriented, Distributed, Interpreted, Robust, Secure, Architecturally neutral, Portable High performance, Dynamic) , Beta various object oriented programming languages Comparativechart.

**An Introduction to Unified Modelling Language (UML):** UML (Goals, History, use), Definition, UML Diagrams (Use case, class, interaction diagrams), State diagrams, Activity Diagrams, Physical diagrams.

**C++ — An Introduction**

**Overview of C++:** Programming Paradigms (Procedural Programming, Modular Programming, Data Abstraction, Object Oriented Programming), Concepts of C++ functions and files.

**Classes and Objects:** Definition and Declaration of a class, Scope Resolution Operation, Private and Public member functions, Creating Objects, Accessing class data members and member functions, Arrays of objects, Objects as Function Arguments.

**Operator overloading:** Operator Functions, large objects, Assignment and initialization, Function Call, Increment, Decrement Operator, Friends.

**Inheritance-Extending classes:** Concept of inheritance, Base class and Derived class, visibility Modes, Single inheritance Multiple Inheritance, Nested classes, virtual functions.

**Streams and Templates:** Output, Input, Files Exception, handling and streams, Templates.

## MCA-06 (Database Management System)

**The Database Management System Concepts**

**Basic Concepts:** Need for a database Management System, The logical DBMS Architecture, Physical DBMS Architecture, Commercial Database Architecture, Data Models.

**Relational AND E-R Models:** The Relational Model, Relational Constraints, Relational Algebra, Entity Relationship (ER) Model, E-R diagram, Conversion of ER diagram to Relational database.

**Database integrity and Normalization:** Relational Database integrity, Redundancy and Associated problems, Single – valued dependencies, single valued Normalization, desirable properties of decomposition, Rules of Data Normalization.

**File organization in DBMS:** Physical Database Design issues, storage of database on Hard

disks, file organization and its types, types of indexes, Index and tree structure, Multi-key file organization, Importance of file organization on database.

**Structured Query language and transaction Mgt**

**The Structured Query language:**

SQL Data Definition language, DML, Data control, Database objects: Views sequences, Indexes and synonyms, table Handling, Nested Queries.

**Transactions and Concurrency Management:** The transactions, the concurrent transactions, the locking protocol, Deadlock and its prevention, optimistic concurrency control.

**Database Recovery and Security:** Recovery, Recovery Techniques, Security and Integrity, Authorization.

**Distributed and Client Server Databases:** Need for Distribution Database Systems, Structure of distributed Database, Advantages and Disadvantages of DDBMS, Design of Distributed database, client server Database.

**Application Development:** Development of A Hospital Management System, Needs to Develop HMS, Creating a database for HMS, Developing Front and forms, Reports, using Queries and Record set.

**Study Centre Management System: A Case Study**

**A Introduction:** Introduction to Software, Software Development process: Analysis, System Designing, Software Development, Testing and Maintenance.

**MCA-07A (Computer Fundamentals and its Organization)**

**Computer Basks:** Algorithms. A Simple Model of a Computer, Characteristics of Computers. Problem-solving Using Computers**.**

**Data Representation:** Representation of Characters in computers, Representation of Integers, Representation of Fractions. Hexadecimal Representation of Numbers, Decimal to Binary Conversion, Error-detecting codes. Input & Output Devices. Description of Computer Input Units, Other Input methods. Computer Output Units Printers. Plotters)

**Computer Memory:** Memory Cell. Memory Organization, Read Only Memory, Serial Access Memory. Physical Devices Used to Construct Memories. Magnetic Hard Disk, floppy Disk Drives. Compact Disk Read Only Memory, Magnetic Tape Drives.

**Processor:** Structure of Instructions, Description of a Processor. Machine Language and Instruction set Processors used in desktops and lap tops. Specification of a desktop and Lap top computer currently available in the market (Specifications of Processor. motherboard &chipset, memory. interface & capacity of hard disk & DVD drives, 1/0 ports).

**Computer Architecture:** Interconnection of Units. Processor to Memory communication. LO to Processor Communication. Interrupt Structures, Multiprogramming. Processor Features, Reduced Instruction Set Computers (RISC), Virtual merman.

**Software Concepts:** Types of Software. Programming Languages. Software (Its Nature & Qualities). Programming Languages. Operating Systems: History and Evolution. Main functions of OS Multitasking. Multiprocessing. Time Sharing. Real Time Operating System with Examples

## MCA-E3 (Data Warehouse and Mining)

- Introduction
- Data Preprocessing
- Data Warehouse and OLAP Technology: An Overview
- Data Cube Computation and Data Generalization
- Mining Frequent Patterns, Associations, and Correlations
- Classification and Prediction
- Cluster Analysis
- Mining Stream, Time-Series, and Sequence Data
- Graph Mining, Social Network Analysis, and Multirelational Data Mining
- Mining Object, Spatial, Multimedia, Text, and Web Data
- Applications and Trends in Data Mining

Reference Book: Data mining: concepts and techniques

By Han, Jiawei, Micheline Kamber, and Jian Pei. (Morgan Kaufman Publication

**MCA-E4 (Systems Analysis and Design)**

**Introduction to Systems Development**

**Introduction to SAD:** Fundamentals of Systems, Real Time Systems, Distributed Systems, Development of a successful System, various Approaches for Development of information systems (Model Driven, Accelerated approach, Joint Application Development.

**System Analyst – A profession:** Needs Systems Analysts, users, Analysts in various functional Areas (Systems Analyst in Traditional Business, Systems Analyst in Modern Business), Role of a Systems Analyst, Duties of a Systems Analysts, Qualification of a Systems Analyst.

**Process of System Development:** Systems Development Life Cycle, Phases of SDLC, Products of SDLC Phrases, Approaches to Development (Prototyping, Joint Application Design, Participatory Design ), Case Study (College Library).

**Introduction to documentation of Systems:** Concepts and process of Documentation, Types of Documentation, Different Standards for Documentation, Documentation and Quality of Software.

**Planning and Designing Systems**

**Process of Systems Planning:** Fact Finding Techniques, Need for fact finding, Issues involved in Feasibility Study, Cost Benefit Analysis, Preparing Schedule, Gathering Requirements of System.

**Modular and Structured Design:** Design principles (Top Down Design, Bottom up Design), Structure Charts, Modularity (Goals of Design, Coupling, Cohesion).

**System Design and Modeling:** Logical and Physical Design, Process Modelling, Data Modeling (ER Diagram), Process specification Tools (Decision Tables, Decision Trees, Structured English Notation), Data Dictionary.

**More Design Issues and Case Tools**

**Forms and Reports Design:** Forms, Reports, Differences between forms and Reports, Process of Designing Forms and Reports, Deliverables and outcomes, Design specifications, Types of Information, General formatting Guidelines, Guidelines for Displaying Contents, Criteria for form Design, Criteria for Report Design.

**Physical file Design and Database Design:** Introduction to Database Design, Design of Database fields, Design of Physical Records, Design of Physical Files, Design of Database, Case Study (Employee database).

**Case Tools for Systems Development:** Use of Case Tools by Organizations, Advantages and Disadvantages of CASE Tools, Components of CASE, Types of CASE tools, classification of CASE Tools, Reverse and Forward Engineering, Visual and Emerging Case tools.

**Implementation and Security of Systems & MIS**

**Implementation and Maintenance of Systems:** Implementation of Systems, Maintenance of Systems.

**Audit and Security of Computer Systems:** Definition of Audit, Audit of Transactions on computer, Computer Assisted Audit Techniques, Computer System and Security Issues, Concurrent Audit Techniques.

**Management Information Systems:** Role of MIS in an organization, Different kinds of information systems, Expert Systems.

## MCA-09 (Software Engineering)

**Block 1: Overview of Software Engineering**

**Unit 1: Software Engineering and its models:** Evolution of Software Engineering, Software development models, Capability maturity models, Software process technology.

**Unit 2: Principles of Software Requirements Analysis**: Engineering the product, Modelling the system architecture, Software prototyping and specification.

**Unit 3: Software Design:** Data design, Architectural design, Interface design, HCI design, Modular design.

**Unit 4: Software testing**: Testing techniques, Testing for specialized environments, Debugging.

**BLOCK 2: Software Project Management**

**Unit 5: Software Project Planning**: Different types of project metrics, Software project estimation, Models for estimation, automated tools for estimation

**Unit 6: Risk management and Project Scheduling**: Identification of Software risks, Monitoring of risks, Management of risks, Formulating a task set for the project, Choosing the tasks of software engineering, Scheduling methods, The Software project plan

**Unit 7: Software Quality Assurance**: Formal technical reviews, Software reliability, Software quality standards

**Unit 8: Software change management**: Baselines, Version control, Change control, Auditing and reporting

**BLOCK 3: Advanced Software Engineering**

**Unit 9: Web Software Engineering**: Different layers, Issues of management of web based projects, Metrics, Analysis, Design, Testing.

**Unit 10: Mobile Software Engineering**: Transition from design to coding of mobile applications, Elements of mobile applications, Approaches to the development of mobile applications

**Unit 11: CASE tools**: Analysis tools, Design tools, SQA tools, UI design tools, Software testing tools, Web engineering tools

**Unit 12: Advanced Software Engineering**: Clean room Software engineering, Component based Software engineering, Re-engineering, Reverse engineering

## MCA-10 (Data Communication and Computer Networks)

**Introduction to data Communication and computer network concepts Introduction to computer Networks:** Network Goals and Motivations, classification of Networks, Network topology, Application of Network, Networking model, Network Architecture, ARPANET, Types of Networks, Advantages of Networks.

**Data Transmission:** Data communication Terminology, Models of Data Transmission, Analog and Digital data transmission, Transmission Impairments, Transmission Media and its Characteristics, wireless transmission, wireless LAN.

**Data Encoding and Communication Technique:** Encoding, Analog-to-Analog Modulation, Analog to Digital Modulation, Digital to Analog Modulation, Digital to Digital Encoding.

**Multiplexing and Switching:** Multiplexing, Digital Subscriber lines, ADSL Vs. CABLE, Switching.

**Media Access Central and Data Link Layer**

**Data Link Layer Fundamentals:** Farming, Basics of Error Detection, Forward error Correction, cyclic redundancy check Codes for error detection, Flow Control.

**Retransmission Strategies:** Stop & wait ARQ, GO-BACK ARQ, Selective Repeat ARQ pipelining, piggybacking.

**Contention – Based Media Access Protocols:** Advantages of Multiple Access sharing of channel Resources, Pure Aloha, Slotted Aloha, CSMA, CSMA/CD, Ethernet frame format (IEEE 802.3).

**Wireless LAN and Data link layer switching:** Introduction to wireless LAN, wireless LAN architecture (IEEE802.11), Hidden station and Exposed Station problems, wireless LAN Protocols: MACA and MACAW, IEEE 802.11 protocol stack, switching at Data link layer.

**Network layer**

**Introduction to layer functionality and Design issues:** Connection oriented vs. connectionless services, Implementation of the network layer services, comparison between virtual circuit and Datagram subnet, Addressing, concept of Congestion, Routing concept.

**Routing Algorithms:** Flooding, shortest path routing algorithm, Distance vector routing, Link state routing, Link state routing, Hierarchical routing, Broadcast routing, Multicast routing.

**Congestion Control in Public Switched Network:** Reasons for congestion in the network, congestion control vs flow control, congestion prevention mechanism, General principles of congestion prevention mechanism, General principles Congestion control, open loop control, congestion control in Packet-switched Network.

**Internet working:** Internet working, Network layer protocols, ICMP, OSPF, BGP.

**Transport Layer and Application Layer Services**

**Transport Services and Mechanism:** Transport services, Elements of transport layer protocols.

**TCP/UDP:** Services provided by internet transport protocols, Introduction to (UDP, TCP), TCP segment header TCP connection establishment, TCP connection Termination, TCP Flow control, TCP Congestion control, Remote procedure call.

**Network Security-I:** Cryptography, Symmetric key cryptography, public key cryptography, Mathematical background.

**Network Security-II:** Digital Signatures, Management of public Keys, Communication Security, Web Security.

## MCA-11 (Java Programming)

**Object Oriented Technology and Java**

**Object Oriented Methodology-1:** Paradigms of Programming languages, Evolution of 00 Methodology, Basic Concepts of OO Approach, Comparison of object oriented and procedure – oriented Approaches, Benefits of OOPS, Applications of OOPS.

**Object oriented Methodology-2:** Classes and objects, Abstraction and Encapsulation, Inheritance, Method overriding and Polymorphism.

**Java Language Basics:** Introduction to Java, Primitive Data Type and Variables, Java Operators.

**Expressions Statements and Arrays:** Expressions, Statements, Control Statements, Selection Statements, Iterative Statements, Jump statements, Arrays.

**Object oriented concepts and Exceptions Handling**

**Class and objects:** Class Fundamentals, Introducing Methods, this Keyword, Using objects as Parameters, Method overloading, Garbage collection, the finalize (), Method.

**Inheritance and Polymorphism:** Inheritance Basics, Access, Multilevel, inheritance, Method overriding Abstract classes, Polymorphism, Final Keyword.

**Packages and interfaces:** Package, Accessibility of Packages, using Package members, Interfaces, Implementing interfaces, interface and Abstract classes, Extends and Implements together.

**Exceptions Handling:** Exception, Handling of Exception, Types of Exceptions, Throwing, Exceptions, writing Exception subclasses.

**Multithreading, I/O, and Strings Handling**

**Multithreaded Programming:** Multithreading, The Main thread, JAVA Thread Model, Thread Priorities, Synchronization in JAVA, Inter thread Communication.

**I/O In Java:** I/O Basics, Streams and stream, Classes, the predefined streams, Reading from and writing to console, reading and writing files, the transient and volatile Modifiers, using instance of Native Methods.

**Strings and Characters:** Fundamental of Characters and Strings, the String class, String operations, Data Conversion using value of () Methods, Strings Buffer and Methods.

**Exploring Java I/O:** Java I/O classes and interfaces, Stream classes, Text streams, Stream Tokenizer, Serialization, Buffered stream, print stream, Random Access file.

**Graphics and user interfaces**

**Applets:** The applet class, Applet architecture, An applet Skeleton: Initialization and Termination, Handling events, HTML Applet TAG.

**Graphics and user interfaces:** Graphics contests and Graphics objects, user interface components, Building user interface with AWT, Swing – Based GUI, Layouts and layouts and layout Manager, Container.

**Networking Features:** Socket overview, Reserved parts and proxy servers, Internet Addressing: Domain Naming Services (DNS), Java and The Net: URL, TCP/IP Sockets, Datagrams.

**Advance Java:** Java database connectivity, an overview of RMI Application, Java Servlets, Java Beans.

## MCA-E5 (Mobile Computing)

- Mobile Communications: An Overview
- Mobile Devices and Systems
- GSM and Other 2GArchitectures
- Wireless Medium access Control, CDMA, 3G and 4GCommunication
- Mobile IP network layer
- Mobile Transport Layer

- Databases and Mobile Computing
- Data Dissemination and Systems for Broadcasting
- Data Synchronization in Mobile Computing Systems
- Mobile Devices: Application Servers and Management
- Mobile Ad-hoc and Wireless Sensor Networks
- Mobile Wireless Short range Networks and Mobile Internet
- Mobile Application Languages- XML, Java, J2ME, and Java Card
- Mobile Application Development Platforms

## MCA-E6 (Parallel Computing)

Block –I Elements of Parallel Computing and Architecture

Unit 1 Introduction to Parallel Computing: Basic concepts about program/process/ thread concurrent Execution Parallel Execution, , granularity, Potential of Parallelism, Need of Parallel Computation, Levels of parallel processing, Parallel processing Vs. Parallel computing, Dataflow Computing concept, Applications of parallel processing: Scientific Applications / Image processing, Engineering ,Application, Database query / Answering applications, A I Applications, Mathematical simulations and modeling.

Unit 2 Classification of Parallel Computers: Types of Classification, Flynn's/ Handler classification, UMA / NUMA /COMA, Loosely coupled / tightly coupled, Classification based grain size and Instruction level parallelism.

Unit 3 Interconnection Network: Need of Interconnection Network, Concept Bandwidth Nod degree diameter bisection bandwidth, In degree and Out degree, Static and Dynamic Interconnection network, Omega, Parallel Shifter, Bens, permutation, hypercube, butterfly, Shuffle exchange Network.

Unit 4 Parallel Computer Architecture: Introduction to various computer architecture, Pipeline processing, Vector / Array processing, VLIW and Super scalar architecture, Associative architecture: Multithreaded architecture.

Block 2 Parallel Algorithm & Parallel Programming

Unit 1 Parallel Algorithm: Introduction to Parallel Algorithms, Analysis of Parallel Algorithms, Different models of computation: Combinational circuit, Permutation Circuit, Sorting circuit, Matrix computation.

Unit –2 PRAM Algorithms: Message passage programming: Shared memory, Message passing libraries, Data Parallel programming, Data Structures for parallel algorithms: Link list, Arrays pointers, Hypercube network.

Unit 3 Parallel Programming: Introduction to Parallel Programming, Types of parallel programming: Programming based on message passing, Programming based on data parallelism, Programming for shared memory systems, Example programs for parallel systems

Block –3 Advanced Topics

Unit 1 Operating System for Parallel Computers: Basic issues of Operating Systems for Parallel Computers, Process Management, Resource Management, Memory management, I/O Management, Inter-Processor Communication, Vectorization Compiler.

Unit 2 Performance Evaluation: Introduction to performance evaluation, Metric of Parallel overhead, Law Speedup, Measurement Tools

Unit 3 Recent Trends for Parallel Computer: Development of last 3 years, Multicomponent CPU, Apex architecture IA, Hyperthreading.

## MCA-13 (Theory of Computation)

**Finite Automata and Formal Languages**

**Finite Automata and Languages:** Regular Expressions (Introduction to Defining of languages, Kleene closure Definition, Formal Definition of Regular, Expressions, Algebra of Regular Expressions), Regular languages, Finite automata, Mealy and Moore Machines. Non Deterministic Finite Automata Equivalence of NFA and DFA, Pumping Lemma, Closure properties (Regular Languages and Finite Automata), Equivalence of Regular expression and Finite Automata.

**Context Free Grammar:** Grammar and its classification, Chomsky, Classification for Grammar, Context free grammar, pushdown Automata (PDA), Non-Context free languages, Pumping Lemma for context free Languages, Equivalence of CFG and PDA.

**Turing Machine and Recursive Functions**

**Turing Machine:** Prelude to formal definition, Instantaneous Description and transition diagrams, Turing Machines as Computer of functions, Modular Construction of Complex turing machines, Symbol Writing machines, Right/Left head moving machines.

**Turing Machine Miscellany:** Extensions –cum-Equivalents of Turing Machine, Universal Turing Machine (UTM), Languages Accepted/Decided by TM, The diagonal language and the universal language, Chomsky Hierarchy.

**Recursive Function Theory:** Recursive Function Theory Recursive Definitions, Partial, Total and Constant Functions, Primitive Recursive Functions, Intuitive Introduction to primitive recursion, Primitive Recursion is weak Technique, The Techniques of unbounded minimization, Partial Recursion and u-Recursion.

**Complexity of Computability**

**Computability/Decidability:** Decidable and undecidable problems, The halting, problem, Reduction to another undecidable problem, decidability of post correspondence problem, undecidable problems for context free languages.

**Complexity:** Notations for Growth rates of functions (The Constant Factor in Complexity Measure, Asymptotic considerations, well known Asymptotic growth rate Notations, The 0Notation, The Notation $\vartheta$, The Notation $\omega$, classification of problems, Reduction, NP-Complete and NP- Hard Problems, Establishing NP-Completeness of problems.

**Applications:** Applications of Finite Automata, Applications of Regular Expressions, Application of Context free grammars (Definition of C-type small language, Definition of Part of HTML), ACM Code of Ethics and Professional Conduct.

## MCA-14 (RDBMS)

**RDBMS Design**

**RDBMS Terminology:** Introduction, Database, Database management system, Instances and Schemas, Traditional File Oriented Approach, Benefits of Conventional or Centralized DBMS, Data Independence, Data Dictionary, Database Security, Domain Definition, A Relation, Relational data integrity, Candidate keys, primary key, Foreign keys, Referential Integrity, Candidate keys and Nulls, Data dictionary checklist.

**Overview of Logical Database Design:** Introduction, The Steps of Database design, Conceptual Design, Schema Refinement, Physical database Design and Tuning, ER Model, ER Model basics (Entity, Entity type and Entity set), Attributes (Attribute, key Attributes in Entity types, Composite vs. Simple attributes, Single vs. Multi valued Attributes, Derived vs. Stored Attributes, Null values, value sets of Attributes, Relationship, Degree of Relationship type, Structural Constraints, weak entities, Components of an E-R Diagram, ER Diagram Development examples.

**Overview of Normalization:** Introduction, Redundancy and associated problems, Role of Normalization, Single valued dependencies, single valued normalizations, (1NF, 2NF, 3NF,BC NF), Desirable properties of decompositions (Attribute Preservation, Lossless-Join Decomposition,DependencyPreservation,LackofRedundancy,DerivingBCNF),Multivalueddependencies, Multivalued Normalization – Fourth Normal Form, The fifth Normal form, Rules of data Normalization.

**Practical on RDBMS:** Introduction, DBMS and file oriented approach, Relational Databases and Integrity Constraints Entity- Relationship diagram, Functional dependency and Normalization, Normalization Structured Query Language (SQL), Microsoft-Access, views and Security using SQL.

**RDBMS Lab: Introduction to MS Access**

**Introducing Microsoft Access:** Introduction, DBMS, Microsoft Access database, tables and Queries, forms and Reports,

**Microsoft Access Basics:** Introduction, Starting and Quilting Microsoft Access, Opening a database, The database window, objects of the Access database.

**Working with database:** Introduction, creating a Microsoft Access database, Creating objects, set toolbars to your working style.

**Creating a table:** Introduction, Plan fields and data types, create a table, set field properties, save and close a table, Add and save records, Edit records and close a table, Modify fields in a table, Modify Columns and rows in datasheet, Attach validation rule to a field.

**Finding Data:** Introduction, Find a value, find and replace, create and apply a filter, specify criteria, sort Records.

**Creating a Query:** Create a Query, The Query Window, Join tables, select fields, specify criteria sort Records, Calculate Totals, Modify a Query, Save a Query.

**Creating a form:** Introduction, Create a form with a form wizard, view records in a form, Add, Delete and save Records, Save and close a form.

**Customizing your form:** Introduction, Change a form's design select and Resize controls, Move and Delete Controls, Change Fonts, Size and color of text.

**Showing data from more than one table on a form:** Introduction, create a form that contains a sub form, use a Query to include fields from more than one table.

**Creating Reports and mailing labels:** Introduction, Use Reports to present data, create a Report, preview, print and save a Report, A Report in design view, create and print mailing labels.

## MCA-15 (Operating Systems Concepts)

**BLOCK 1 Introduction to Operating Systems, Process Management**

Unit 1 Operating System-An Overview, What is an Operating System (OS)?, Goals of an Operating System, Generations of Operating Systems, Types of Operating Systems, Desirable Qualities of OS, Operating Systems : Some Examples, Functions of OS.

Unit 2 Processes: Concept of Process, System Calls for Process Management, Process Scheduling, Scheduling Algorithms, First Come First serve (FCFS), Shortest Job First (SJF), Round Robin (RR), Shortest remaining time next (SRTN), Priority Based Scheduling or Event Driven (ED) scheduling , Performance evaluation of the Scheduling Algorithms.

Unit 3: Interprocess Communication and Synchronization: Interprocess Communication, Interprocess Synchronization, Semaphores, Classical problems in concurrent programming, Locks, Monitors and Conditional Variables.

Unit 4: Deadlocks: Characterization of a Deadlock, A Resource Allocation Graph, Dealing with Deadlock Situations, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery Deadlock detection and recovery, Deadlock Prevention, Havender's Algorithm, Deadlock Avoidance, Banker's Algorithm.

**BLOCK 2: Memory Management, File Management and Security**

Unit 1: Memory Management: Overlays and Swapping, Logical and Physical Address Space, Single Process, Monitor, Contiguous Memory Methods Paging , Principles of operation , Page allocation , Hardware Support for Paging , Protection and Sharing Segmentation , Principles of operation , Address Translation , Protection and Sharing

Unit 2: Virtual Memory Virtual Memory , Principles of operation , Virtual Memory management , Protection and sharing Demand paging Page Replacement policies Thrashing , Working Set Model , Page Fault Rate Demand Segmentation Combined Systems , Segmented paging , Paged segmentation

Unit 3: I/O and File Management: Organization of the I/O function, I/O Buffering, Disk Organization, Disk Scheduling, RAID Disk, Cache, Command language, user‘s view of File System, The System programmer‘s view of the file System, The Operating systems ‘view of file Management, Directories, Disk Space Management, Disk address translation, File related system services, Asynchronous Input / Output.

Unit 4: Security and Protection Security Threats: Security Policies and Mechanisms, Authentication, Passwords, Alternative Forms of Authentication Protection in Computer Systems Security Models, Access-Control Matrix, Mandatory Access Control, Discretionary Access Control, Rule-Based Access Control, Role-Based Access Control, The Take-grant Model, Multilevel Models.

**BLOCK 3: Advanced Topics and Case Studies**

Unit 1: Multiprocessor Systems: Multiprocessor and Processor Coupling , Multiprocessor Interconnections, Bus-Oriented Systems, Crossbar-Connected systems, Hypercubes, Multistage Switch-based systems, Types of Multiprocessor Operating System, Separate Supervisors, Master/Slave, Symmetric Multiprocessor OS, Functions and Requirements, Multiprocessor Synchronization , Test and set, Compare and swap, Fetch and Add.

Unit 2: Distributed Operating Systems, History of Distributed Computing, Distributed Systems, Key features and Advantages of a Distributed System, Design Goals of Distributed Systems, Design Issues Involved in Distributed Systems, Distributed System Structure, Mutual Exclusion in Distributed Systems, Remote Procedure Calls, Other Middleware Technologies

Unit 3: Case Study - UNIX

Unit 4: Case Study – WINDOWS 2000

## MCA-E7 (Artificial Intelligence)

**Block 1: INTRODUCTION TO A.I.**

Unit 1: Introduction To Intelligence And Artificial Intelligence: Some Simple Definition of A.I., Definition by Eliane Rich, Definition by Buchanin and Shortliffe, Another Definition by Elaine Rich, Definition by Barr and Feigenbaum, Definition by Shalkoff.

Unit 2: THE PROPOSITIONAL LOGIC: Introduction, Logical Study of Valid and Sound Arguments, Non-Logical Operators, Syntax of Propositional Logic, Semantics/Meaning in Propositional Logic, Interpretations of Formulas, Validity and Inconsistency of Propositions, Equivalent forms in the Prepositional Logic (PL), Normal Forms, Logical Deduction, Applications.

**Block-2 Knowledge Representation**

Unit-1 The First Order Predicate Logic (FOPL)**:** Syntax of Predicate Logic, Prenex Normal Form (PNF), (Skolem) Standard Form, Applications of FOPL.

Unit-2 Deductive Inference Rules and Methods**:** Basic Inference Rules and Application in PL, Basic Inference Rules and Application in FOPL, Resolution Method in PL, Resolution Method in FOPL.

Unit-3 Systems For Imprecise/Incomplete Knowledge**:** Fuzzy Systems, Relations on Fuzzy Sets, Operations on Fuzzy Sets, Operations Unique to Fuzzy Sets, Non-Monotonic Reasoning Systems, Default Reasoning Systems, Closed World Assumption Systems, Other Non-Deductive Systems.

**Block 3: A.I. Programming Languages**

Unit-1 A.I. Languages-1: LISP**,** Basics of LISP, Data Structures and Data Values, The EVAL Function and Some Evaluations, Evaluation of Primitive Functions, Primitive List Manipulation Functions, Built-in Predicates, Logical Operators: AND, OR and NOT, Evaluation of Special Forms involving DEFUN and COND, The special forms DO and LET, Input/Output, Primitives, Recursion in LISP, Association List and Property List, Lambda Expression, APPLY, FUNCALL and MAPCAR, Symbol, Object, Variable, Representation and Dotted Pair, Destructive Updates, RPLACE, RPLACD and SETF, Arrays, Strings and Structures**.**

Unit-2 A.I. Languages-2: PROLOG, Foundations of Prolog, Notations in Prolog for Building Blocks, How Prolog System Solves Problems, Back Tracking, Data Types and Structures in Prolog, Operations on Lists in Prolog, The Equality Predicate '=', Arithmetic in Prolog, The Operator Cut, Cut and Fail.

**BLOCK 4: Applications of Artificial Intelligence**

Unit 1: Expert Systems: Introduction and Concept of Planning, Representing and Using Domain Knowledge, Expert System, Shells Knowledge Acquisition

Unit 2: Intelligent Agents: Agents and environments, Rationality and other performance measures, Nature of environments, Structure of agents

## MCA-E8 (Embedded Systems)

- Introduction to Embedded Systems
- 8051 and Advanced Processer Architectures Memory Organization and Real world Interfacing
- Devices and Communication Buses for Devices Networks
- Device Drivers and Interrupts Service Mechanism
- Programming Concepts and Embedded Programming in C, C++ and Java
- Program Modelling Concepts
- Interprocess Communication and Synchronization of Processes Threads and Tasks
- Real Time Operating System Programming II Windows CE OSEK and Real Time Linux Functions
- Design Examples and Case Studies of Program Modelling and Programming with RTOS1
- Design Examples and Cases Studies of Program Modelling and Programming with RTOS2
- Embedded Software Development Process and Tools
- Testing Simulation and Debugging Techniques and Tools
- Real Time Operating Systems
- Real Time Operating System Programming I MicroCOSII and VxWorks

## MCA-17 (UNIX Shell Programming)

Book: UNIX Shell Programming

By Yashwant kanitkar (BPB Publications)

- Communication – Unix Style
- Shell Programming - The First Step
- Taking Decisions
- The Loop Control Structure

- Shell Meta characters
- Tricks of The Trade
- Shell Miscellany
- System Administration
- Shell Programming Project

## MCA-18 (Numerical and Statistical Computing)

**BLOCK-1 Numerical Computing-I**

Unit 1 Floating Point Arithmetic and Errors, Floating Point Representation, Sources of Errors, Propagated Errors.

Unit 2 Solution of Non-Linear Equations, Bisection Method, Regula-Falsi Method, Secant Method, Newton-Raphson Method, Successive Iteration Method.

Unit 3 Solution of Linear Algebraic Equations, Direct Method, Gauss Elimination Method (without and with Pivoting), LU-Decomposition Method, Iterative Method, Jacobi Method, Gauss Seidel Method, Successive Over Relaxation Method.

**BLOCK-2 Numerical Computing-II**

Unit 1 Interpolation Differences – Forward and Backward Differences, Newton‘s – Forward and Backward Difference Formulas, Lagrange‘s Interpolation.

Unit 2 Numerical Integration Newton – Cotes Formulas, Composite Formulas, Gaussian Quadrature.

Unit 3 Numerical Solution of ODE, Euler‘s Method, Runge Kutta Method.

**BLOCK-3 Statistical Computing**

Unit 1 Probability Distribution: Discrete Distribution, Binomial Distribution, Poisson Distribution, Continuous Distribution, Uniform Distribution, Exponential Distribution, Normal Distribution, Chi-square Distribution

Unit 2 Pseudo Random Number Generation: Uniform Distribution, Method of Generation (Discrete Case), Inversion Method (Exponential Distribution), Acceptance and Rejection.

Unit 3 Regression: Linear Regression Model, Least Square for Parameter Estimation, Goodness-of-Fit, Residual Analysis, Non-Linear Regression.

## MCA-19 (Design and Analysis of Algorithm)

**ELEMEMTARY ALGORITHMICS Structure :** Introduction, Objectives, Example of an Algorithm, Problems and Instances, Characteristics of an Algorithm, Problems, Available Tools & Algorithms, Building Blocks of Algorithms, Basic Actions & Instructions, Control Mechanisms and Control Structures, Procedure and Recursion, Outline of Algorithmic, Understanding the Problem, Analyzing the Problem, Capabilities of the Computer System, Approximate vs Exact Solution, Choice of Appropriate Data Structures, Choice of Appropriate Design Technology, Specification Methods for Algorithms, Proving Correctness of an Algorithm, Analyzing an Algorithm, Coding the Algorithm

**SOME PRE-REQUISITES AND ASYMPTOTIC BOUNDS Structure:** Some Useful Mathematical Functions & Notations, Functions & Notations, Modular Arithmetic/Mod Function, Mathematical Expectation, Principle of Mathematical Induction, Concept of Efficiency of an Algorithm, Well Known Asymptotic Functions & Notations, Enumerate the Five Well-Known Approximation Functions and How These are Pronounced, The Notation O, The Notation $\omega$, The $\vartheta$ Notation, The Notation o, The Notation w.

**BASICS OF ANALYSIS:** Structure, Introduction, Objectives, Analysis of Algorithms Simple Examples, Well Known Sorting Algorithms, Insertion Sort, Bubble Sort, Selection Sort, Shell Sort, HeapSort, Divide and Conquer Technique, MergeSort, QuickSort, Comparison of Sorting Algorithms, Best-Case and Worst-Case Analyses, Various Analyses of Algorithms, Worst-Case Analysis, Best-Case Analysis, Analysis of Non-Recursive Control Structures, Sequencing, For Construct, While and Repeat Constructs, Recursive Constructs, Solving Recurrences, Method of Forward Substitution, Solving Linear Second-Order Recurrences with Constant Coefficients, Average-Case and Amortized Analyses, Average-Case Analysis 3.8.2 Amortized Analysis.

**DIVIDE-AND-CONQUER:**Introduction,Objectives,GeneralIssuesinDivide-and-Conquer, Integer Multiplication, Binary Search, Sorting, Merge Sort, Quick Sort, Randomization Quick- sort, Finding the Median, Matrix Multiplication, Exponentiation.

**GRAPH ALGORITHMS:** Introduction, Objectives, Examples, NIM/Marienbad Game, Function For Computing Winning Nodes, Traversing Trees, Depth-First Search, Breadth-First Search, Algorithm of Breadth First Search, Modified Algorithm, Best-First Search & Minimax Principle, Topological Sort

**DYNAMIC PROGRAMMING:** Introduction, Objectives, The Problem of Making Change, The Principle of Optimality, Chained Matrix Multiplication, Matrix 'Multiplication Using Dynamic Programming.

**GREEDY TECHNIQUES:** Introduction, Objectives, Some Examples, Formalization of Greedy Technique, Function Greedy- Structure (GV: set): Set, Minimum Spinning Tree, Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm.

**MODELS FOR EXECUTING ALGORITHMS-I: FA:** Regular Expressions, Introduction to Defining of Languages, Kleene Closure Definition, Formal Definition of Regular Expressions, Algebra of Regular Expressions, Regular Languages, Finite Automata, Definition, Another Method to Describe FA.

**MODELS FOR EXECUTING ALGORITHMS-II: PDFA & CFG:** Formal Language & Grammar, Context Free Grammar (CFG), Pushdown Automata (PDA).

**MODELS FOR EXECUTING ALGORITHMS - III : TM:** Prelude to Formal Definition, Turing Machine: Formal Definition and Examples, Instantaneous Description and Transition Diagram, Instantaneous Description, Transition Diagrams, Some Formal Definitions, Observations, Turing Machine as a Computer of Functions.

**ALGORITHMICALLY UNSOLVABLE PROBLEMS:** Decidable and Undecidable Problems, The Halting Problem, Reduction to Another Undecidable Problem, Undecidability of Post Correspondence Problem, Undecidable Problems for Context Free Languages, Other Undecidable Problems.

**COMPLEXITY OF ALGORITHMS:** Notations for the Growth Rates of Functions, The Constant Factor in Complexity Measure, Asymptotic Considerations, Well Known Asymptotic Growth Rate Notations, The Notation O, The Notation $\omega$, The Notation $\theta$, The Notation o, The Notation w), Classification of Problems, Reduction, NP-Complete and NP-Hard Problems, Establishing NP-Completeness of Problems.

## MCA-E9 (Computer Graphics)

**BLOCK 1: Raster Graphics and Clipping**

Unit 1: Introduction to Computer Graphics What is Computer Graphics? Application of Computer Graphics , Presentation Graphics , Painting and Drawing , Photo Editing , Scientific Visualization 68 , Image Processing , Digital Art , Education, training, Entertainment and CAD , Simulation , Animation and Games Graphics Hardware Input and Output Devices , Touch Panel , Light Pens , Graphic Tablets , Plotters , Film Recorders Display Devices Refreshing Display Devices , Raster-Scan, Random-Scan Plasma Panel and LCD panels

Unit 2: Graphics Primitives Points and Lines Line-drawing Algorithms, DDA Algorithm , Bresenham's line Algorithm Circle-generating Algorithm , Properties of Circles , Midpoint Circle of Algorithm Polygon Filling Algorithm: Scan-Line

Unit 3: 2-D Viewing and Clipping Point Clipping Line Clipping, Cohen-Sutherland Line Clippings, Cyrus-Beck Line Clipping Algorithm Polygon Clipping: Sutherland Hodgman Algorithm, Windowing Transformation.

**BLOCK 2: Transformations**

Unit 4: 2-D and 3-D Transformations Basic Transformations , Translation , Rotation, Scaling , Shear Composite Transformations o Rotations about a point, Reflection about a line Homogeneous Coordinate Systems 3-D Transformations

Unit 5: Viewing Transformation Projections, Parallel Projection, Orthographic & Oblique Projections, Isometric Projections Perspective Projections

**BLOCK 3: Modelling & Rendering**

Unit 6: Curves and Surfaces Polygon Representation Methods, Polygon Surfaces, Polygon Tables, Plane Equations, Polygon Meshes Bezier Curves and Surfaces, Bezier Curves, Properties of Bezier Curves, Bezier Surfaces Surface of Revolution

Unit 7: Visible – Surface Detection Depth Buffer Method Scan-Line Method Area-Subdivision Method

Unit 8: Polygon Rendering and Ray Tracing Methods Illumination Model, Ambient Reflection, Diffuse Reflection, Specular Reflection Shading, Gouraud Shading, Phong Shading Ray Tracing, Basic Ray-Tracing Algorithm

**BLOCK 4: Multimedia and Animation**

Unit 9: Computer Animation Basic of Animation Types of Animation Simulating Accelerations Computer Animation Tools Applications

Unit 10: Multimedia Concepts and Applications Concepts of Hypertext/Hypermedia Multimedia Applications, Education, Video Conferencing, Training, Entertainment, Electronic Encyclopaedia Images Audio and Video, Analog and Digital Sound and Video, Mpeg, mpi, wav, etc. Multimedia Tools

## MCA-E10 (Operations Research)

### Introduction to Operations Research

**Operation Research – An Overview:** History, Approach, Techniques and Tools, Relation- ship Between O.R. specialist and Manager, Applications of OR., Phases and Processes of O.R., Study, Limitations of operation Research,

**Decision and Loop Control Statements:** Review of Probability and Statistics Random Experiment and Probability, Random variable, Probability distribution, Standard Discrete Probability distributions, Continuous Probability Distributions.

**Programming Techniques – Linear Programming and Applications: Linear Programming – Graphical Method:** Formulation of a linear programming problem, Formulation with Different types of constraints, Graphical Analysis, Graphical Solution, Multiple, unbounded solution and infeasible problems, Application of linear programming in Business and Industry, self-Assessment Exercises.

**Linear Programming – Simplex Method:** Principle of Simplex Method, Computational Aspect of simplex Method, Simplex Method with Several Decision Variables, Two phase and M-Method, Multiple, unbounded solutions and infeasible problems, sensitivity Analysis, Dual Linear Programming problem.

**Transportation Problem:** Basic Feasible solution of a transportation problem (The North West Corner Rule, Matrix Minimum Method, Vogel Approximation Method

(VAM), Modified Distribution (MODI) Method stepping store Method, Unbalanced Transportation problem, Degenerate Transportation problem, Transhipment problem, Maximization in a transportation problem,

**Assignment problem:** Unbalance Assignment problem, Problem with some infeasible Assignments, Maximization in an Assignment problem. Crew Assignment problem.

**Programming Techniques Further Applications**

**Goal Programming:** Concepts of Goal Programming, Goal Programming Model Formulation, Graphical Method of goal programming, the simplex Method of Goal Programming, Application Area of Goal Programming,

**Integer Programming:** Integer Programming Formulation Techniques, Unimodularity, cut- ting plane method, Branch and Bound.

**Dynamic Programming**: Dynamic Programming Methodology, Definitions and Notations, D.P. Applications.

**Non-Linear Programming:** Solution of a Non-linear Programming problem, Convex and Concave function, KUHN TUCKER conditions for constrained optimization, Quadratic Programming, Separable Programming.

**Inventory and Waiting Line Models**

**Inventory Control – Deterministic Models:** Inventory: An Essential Requirement, objectives of inventory, Functions of inventory, Classifications of inventory, Factors Affecting inventory, Inventory Modelling, Deterministic single item inventory models Deterministic Multi item inventory Models.

**Inventory Control : Probabilistic Models:** Inventory Model with probabilistic Demand, Single period probabilistic Models, Multi-period probabilistic Models, Inventory Control systems, Fixed Order, Quantity system, Periodic Review System, other variants of probabilistic Models.

**Queueing Models:** Characteristics of A Queueing Model, Notations and symbols, Statistical Methods, in Queueing, The M/M/I System, The M/M/C system, The M/E k /I System, Decision Problems in Queueing.

**Game Theory and Simulation**

**Competitive situations: Game Theory:** Definitions and Explanation of some important terms saddle points, dominance, mixed strategies: Games without saddle points, 2 x n Games, Exploiting an Opponents and Mistakes.

**Simulation:** Reasons for using simulation, limitations of simulation, steps in the simulation process, Practical Applications of simulation, Hospital Simulation, Simulation and Inventory Control, Computer Simulation.

**Case Studies:**

**Case 1:** Insulator India Limited.

**Case 2:** Use of Operations Research Techniques: A Case Study of ECS Corporation.

## MCA-22 (Probability and Distribution)

**Unit 1: Probability measure and distribution functions**

Probability space of a random experiment .probability measures, random variables as a measurable function. Field induced by a sequence of random variables, decomposition of distribution functions in purely discrete, absolutely continuous and singular components.

**Unit 2: Probability Inequalities**

CR-inequality, Cauchy-Schwartz inequality, Holder inequality, Minkowski inequality, Jensen inequality, Lyapunov inequality, Kolmogorov inequality, Hajck-Renyki inequality.

**Unit 3: Convergence**

Sequences of distribution functions, Helly - Bray theorem, Different types of convergence of sequence of random variables distribution function of random vectors, Weak and strong law of large numbers, Khinchin. Borel and Kolmogorav theorems.

**Unit 4: Characteristic function and central limit theorems**

Borel-Cantelli lemmas and zero-one law, Characteristic function, Inversion theorem, Continuity theorem, One dimensional central limit problem: lindeberg-levy, Lyapunov, Lindeberg-Feller theorems.

## MCA-23 (Web Technology)

**UNIT- I**

History of the Internet and World Wide Web -III ML 4 protocols - RCM, SMTP, POP), MIME, IMAP. Introduction to JAVA Scripts - Object Based Scripting for the web, Structures - Functions - Arrays - Objects.

**UNIT- II**

Introduction - Object refers, Collectors all and Children. Dynamic style, Dynamic position, frames. navigator, Event Model - On check - On load - Onenor - Main rel - Form process - Event Bubblers- filters -Transport with the Filter - Creating Images Adding shadows - Creating Gradients - Creating Motion with Bar-Data Binding - Simple Data Binding - Moving with a record set - Sorting table data, binding of an image and table

**UNIT- III**

database, Relational Database model - Overview, SQL - ASP - Working of ASP - Objects - File System Objects - Session tracking and cookies - ADO - Access a Database from ASP - Server side Active-X Components - Web Resources - XMIL - Structure in Data Name spaces - D7D-Vocabularies - DOM methods.

**UNIT -IV**

Introduction, Servlet, Overview Architecture - Dandling II P Request - Go and post request - redirecting request multi-tier applications - ISP - Overviews - Objects - scripting - Standard Actions - Directives. Brief survey of Web 2.0 technologies, introduction to Semantic web and other current technologies

## MCA-24 System Software

**Block 1: Introduction to System Software and software tools**

**Unit 1: Language Processors:** Introduction, Language Processing Activities, Fundamentals of Language Processing & Language Specification, Language Processor Development Tools.

**Unit 2: Data Structures for Language Processing:** Search Data structures, Allocation Data Structures.

**Unit 3: Software Tools:** Software Tools for Program Development, Editors, Debug Monitors, Programming Environments, and User Interfaces.

**Unit 4: Assemblers:** Elements of Assembly Language Programming, A Simple Assembly Scheme, Pass Structure of Assemblers, Design of a Two Pass Assembler, A single pass Assembler for IBM PC.

**Unit 5: Macro Processors:** Macros and Macro Processors: Macro Definition and Call, Macro Expansion, Nested Macro Calls, Advanced Macro Facilities, Design of a Macro Preprocessor.

**Block 2: Compilers and Interpreters**

**UNIT 6 COMPILER- LEXICAL ANALYSIS**

Introduction to NFA and DFA, Lexical Analysis: Role of a Lexical analyzer, input buffering, specification and recognition of tokens, Finite Automata, Designing a lexical analyzer generator, Pattern matching based on NFA's.

**UNIT 7 COMPILER- SYNTAX ANALYSIS**

Syntax Analysis: Role of Parser, Top-down parsing, recursive descent and predictive parsers (LL), Bottom-Up parsing, Operator precedence parsing, LR, SLR and LALR parsers.(First and follow technique for generating a parse table is to be taught), Phases of the Compiler, Aspects of compilation, Memory allocation. Compilation of expressions and control structures.

**UNIT 8 COMPILER- CODE GENERATION**

Intermediate languages: graphical representations, DAGs, Three address code, types of three address statements, syntax directed translation into three address code, implementation of three address statements.

**UNIT 9 COMPILER- OPTIMIZATION** Code Optimization: Machine dependent and machine independent code generation: Sources of optimization-Code Generation-Semantic stacks, evaluation of expressions, control structures, and procedure calls.

**Unit 10: Interpreters:** Use and overview of interpreters, pure and impure interpreters

**Block 3: Linker, Loaders and device Drivers**

**Unit 11: Loaders and Linkers**

Basic loader functions: Design of an Absolute Loader – A Simple Bootstrap Loader, Machine dependent loader features Relocation – Program Linking – Algorithm and Data Structures for Linking Loader. Machine-independent loader features – Automatic Library Search – Loader Options Loader design options – Linkage Editors – Dynamic Linking – Bootstrap Loaders. Implementation examples: MSDOS linker.

**Unit 12: Device drivers**

Design and anatomy of UNIX device driver, Types of device driver, General design of UNIX character device driver, General design of UNIX block device driver, UNIX device driver installation.

## MCA-E11 (Object Oriented Analysis and Design)

**INTRODUCTION TO OBJECT ORIENTED MODELING:** Introduction, Objectives, Object Oriented Modeling, Basic Philosophy of Object Orientation, Characteristics Object Oriented Modeling, Class and Objects, Links and Association, Generalization and Inheritance, An Object Model, Benefits of OO Modeling, Introduction to OOA& Design Tools.

**OBJECT ORIENTED ANALYSIS:** Introduction, Objectives, Object Oriented Analysis, Problem Statement: An Example, Differences between Structured Analysis and Object Oriented Analysis, Analysis Techniques t, Object Modeling, Dynamic Modeling, Functional Modeling, Adding Operations, Analysis Iteration, Refining the Ratio Analysis, Restating the Requirements

**USING UML:** Introduction, Objectives, UML: Introduction, Object Modeling Notations: Ba- sic 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, Summary.

**SYSTEM DESIGN:** Introduction, Objectives, System Design: An Object Oriented Approach, Breaking into Subsystems, Concurrency identification, Management of a Data Store, Controlling Events Between Objects, Handling Boundary Conditions

**OBJECT DESIGN:** Introduction, Objectives, Object Design for Processing, Object Design Steps, Choosing Algorithms, Selecting Data Structure, Defining Internal Classes and Operations, Assigning Responsibility for Operation, Design Optimization, implementation of Control, State as Location within a Program, State Machine Engine, Control as Concurrent Tasks, Adjustment of Inheritance, Rearranging Classes and Operations, Abstracting Out Common Behavior, Design of Associations, Analyzing Association Traversal, One-way Associations, Two-way Associations **ADVANCE OBJECT DESIGN:** Introduction, Objectives, Control awl its Implementation, Control as a Stake within Program, Control as a State Machine Engine, Control as Concurrent Task, Inheritance Adjustment, Association: Design, Object Representation, Design Optimization, Design Documentation.

**OBJECT MODELING:** Introduction, Objectives, Advanced Modeling Concepts, Aggregation, Abstract Class Multiple Inheritance, Generalization and Specialization, Meta Data and Keys, Integrity Constraints, An Object Model

**DYNAMIC MODELING:** Introduction, Objectives, Events, State and State Diagram, Elements of a State Diagram, Advanced Concepts in Dynamic Modeling, Concurrency - A Dynamic Model.

**FUNCTIONAL MODELING:** Introduction, Objectives, Functional Models, Data Flow Diagrams, Features of a DFD, Processes, Data Flows, Actors, Data Stores, Constraints, Control Flows, Design Flaws in DFD, A Sample Functional Model, Relation of Functional to Object and Dynamic Model

**IMPLEMENTATION STRATEGIES:** Introduction, Objectives, Implementation Associations, Unidirectional Implementations, Optional Associations, One-to-One Associations, Associations with Multiplicity 'Many', Bi-directional Implementations, One-to-One and Optional Associations, One-to-Many Associations, Immutable Associations, Implementing Associations as Classes, Implementing Constraints, Implementing State Charts, Persistency.

**OBJECT MAPPING WITH DATABASE:** Introduction, Objectives, Relational Database Schema for Object Modes, General DBMS Concepts, Relational DBMS Concepts, RDBMS Logical Data Structure, Object Classes to Database Tables, Extended Three Schema Architecture for Object Models, The use of Object IDs, Mapping Object Classes to Tables, Mapping Associations to Tables, Mapping Binary Associations to Tables, Mapping Many-to-Many Association to Tables, Mapping Ternary Associations to Tables, Mapping Generalizations to Tables, Interfacing to Databases,

**CASE STUDY: INVENTORY CONTROL SYSTEM:** Introduction, Objectives, Class Diagram, Object Diagram, Generalization and Association Diagram, Collaboration Diagram, Activity Diagram and Events, Use Case Diagram, Deployment Diagram.

## MCA-E12 (Information and Network Security)

Book: Cryptography and Network Security, by, William Stallings Or Book by, Atul Kahate

- Classical Encryption Techniques
- Block Ciphers
- Finite Fields
- Advanced Encryption Standard
- Confidentiality Using Symmetric Encryption
- Number Theory
- Public-Key Cryptography and RSA
- Other Public-Key Cryptosystems
- Hash Algorithms
- Digital Signatures
- Authentication Applications
- Electronic Mail Security
- IP Security
- Web Security
- Intruders
- Malicious Software
- Firewalls