ANNEXURE I
MCA PROGRAMME STRUCTURE

Course Code	Sem	MCA	Marks	Credit
MCA(S1)01	1st	Computer Fundamentals and PC Software	10+50+40p	4
MCA(S1)02		Digital Techniques	20+80	4
MCA(S1)03		Computer Programming using C	10+50+40p	4
MCA(S1)04		Fundamentals of Networking and Web Technology	10+50+40p	4
MCA(S2)05	2nd	Computer Organization and Architecture	20+80	4
MCA(S2)06		Data Structure through C Language	10+50+40p	4
MCA(S2)07		Fundamentals of Database Management System	10+50+40p	4
MCA(S2)08		**Project I**	100	4
MCA(S3)09	3rd	Introduction to Discrete Mathematics and Formal Languages and Automata	20+80	4
MCA(S3)10		Object-Oriented Programming through C++	10+50+40p	4
MCA(S3)11		Operating System	20+80	4
MCA(S3)12		System Analysis and Design	20+80	4
MCA(S4)13	4th	Programming in Java	10+50+40p	4
MCA(S4)14		Computer Graphics	20+80	4
MCA(S4)15		Linux System Administration	10+50+40p	4
MCA(S4)16		Fundamentals of Management	20+80	4
MCA(S5)17	5th	Open Source Software	10+50+40p	4
MCA(S5)18		Web Technology	10+50+40p	4
MCA(S5)19		Data Communication and Computer Networks	20+80	4
MCA(S5)20(A)		**Elective I**: Image Processing	10+50+40p	4
MCA(S6)21	6th	System Software	10+50+40p	4
MCA(S6)22(A)		**Elective II:** Data Warehousing and Data Mining	20+80	4
MCA(S6)23		**Major Project**	200	8
Total Marks:			**2400**	**96**

20% marks in each course (without practical) and 10% (with practical) shall be for Home Assignment wherever indicated. Courses having practical are indicated with a letter 'p'.

1 credit = 30 hours of learning

4 credit=30*4=120 hours

ANNEXURE II
MCA DETAILED COURSE WISE SYLLABUS

MCA (S1) 01: Computer Fundamentals and PC Software

Unit 1: Introduction to Computer
Block Diagram of Computer, Evolution, Generations, Classification and its Application

Unit 2: Number System
Representation of numbers (only a brief introduction to be given) and characters in computer, Binary, Hexadecimal, Octal, BCD, ASCII, EDCDIC and Gray codes, Conversion of bases, Representation of signed integers, Sign magnitude, 1's complement and 2's complement representation, Arithmetic operations using 2,,s complement representation and conditions for overflow/underflow and its detection.

Unit 3: Basic Components of Computer
Concept of Bit and Byte; CPU, ALU, CU; Computer Memory: Primary and Secondary; Input/Output Devices; Buses: Address, Data and Control.

Unit 4: Introduction to Computer Security
Computer Virus, Worm, SpyWare, Malware, Trojan horse, Antivirus Software

Unit 5: Hardware Configuration
Different hardware configuration (Laptop/desktop), Typical RAM/ Hard disk size, Mother board series, different OEM(original equipment manufacturer), Processor series, FCC & UL for quality measure, Introduction to different standard ports/buses and display technology.

Unit 6: Introduction to OS
Definition and functions of an Operating System, Types of OS (Single User, Multi user, Single tasking, Multitasking, Real time, Network OS, Distributed OS)

Unit 7: MS DOS Operating System
Introduction to DOS, System files of DOS, concept of Booting, Files and Directory Structure, Concept of Paths, Internal and External commands, Batch File.

Unit 8: MS Windows Operating System
Features of Windows 7, Exploring Components of Windows: The Desktop, The Icons, Working with Windows, The Start Menu and Taskbar, Quiting Windows; Customizing the Desktop, Files and Folders.

Unit 9: LINUX Operating System
Open Source and Free Software, Advantages and Disadvantages of Linux Operating System, Concept of Path, Basic Linux Commands, File Permission, Text Editor vi.

Unit 10: Word Processor -Part I
Starting MS-Word, Document Window and its Components, Different Bars, Document View, Creating a New Document, Saving a Document, Opening an Existing Document, Exiting MS-Word, Working with Text, Working with Paragraph, Bullets and Numbering, Find and Replace, Copy, Cut and Paste

Unit 11: Word Processor-Part II
Spelling and Grammar Checking, Undo and Redo option, Header and Footer, Page Setup, Printing Documents, Inserting Picture, Working with Tables: Inserting Table, Deleting Table, Traversing Table, Selecting a Table, Rows and Columns, Deleting Rows and Columns, Merge and Split Cells; Creating Multiple Columns

Unit 12: Spreadsheet-Part I
Starting MS-Excel, Working with Toolbars, Row, Column and Cell, Working with Excel: Creating a New Workbook, Working with Cells and Fonts, Merging Cells, Inserting and Deleting Rows and Columns; Saving a Workbook, Closing a Workbook;

Unit 13: Spreadsheet-Part II
Different Operators used in Excel; Working with Formula and Functions; Sorting Data; Working with Charts.

Unit 14: Introduction to Documentation and Presentation
Starting MS-PowerPoint, Creating a New Presentation, Working with Slides, Applying Text and Graphics, Applying Themes, Customizing Slide Show, Saving, Running and Closing a Presentation, Opening an Existing Presentation

Unit 15: Threats and Legal Framework Cyber Crimes against Individuals, Institution and State, Hacking , Digital Forgery, Cyber Stalking/Harassment, Cyber Pornography, Identity Theft & Fraud, Cyber terrorism, Cyber Defamation, Different offences under IT Act, 2000

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MCA (S1) 02: Digital Techniques

Unit 1: Introduction to Number Systems
Decimal, Binary, Hexadecimal and Octal number system, Number system conversion

Unit 2: Binary Arithmetic
Complement: r's and (r-1)'s complement, Binary addition, Binary subtraction, Binary Multiplication, Binary division.

Unit 3: Data Representation
Fixed Point representation and Floating point representation

Unit 4: Code Conversion Technique
Gray code, BCD, Code conversion technique, ASCII, EBCDIC, Unicode, ISO

Unit 5: Boolean algebra
Introduction, Properties of Boolean Identities, Properties of Positive and Negative Logic

Unit 6: De-Morgan's Theorem and Application
De-Morgan's Theorem, Application of De-Morgan's theorem.

Unit 7: Basic Logic Gates
Logic Gates: AND, OR, NOT.

Unit 8: Universal Gates
NAND, NOR, XOR; Conversion of the Logic Gates, NAND and NOR Implementation of Basic Gates.

Unit 9: Introduction to IC
LSI, MSI, VLSI.

Unit 10: Reduction Techniques
Boolean Expression, Simplification of Boolean expression by Algebraic method and Karnaugh Map, SOP, POS, Standard and Canonical form, Conversion of SOP to POS and vice-versa, Reduction upto 3-variables.

Unit 11: Combinational Circuit
Definition and Properties of Combinational Circuit, Introduction to Multiplexer, 4-to-1 multiplexer, Demultiplexer, Encoder, Decoder,

Unit 12: Binary Arithmetic Circuits
Half adder, Full adder, Binary Half subtractor, Full subtractor

Unit 13: Sequential Circuit
Definition and Properties of Sequential Circuit, Block Diagram of Sequential Circuit, Types of Sequential Circuit, Introduction to Flip-Flop and its different types: RS, JK; Master-Slave JK Flip-Flop.

Unit 14: Registers and Counters
Shift Register: Introduction, Properties and Applications, Types of Shift Registers: SISO, PISO, SIPO, PIPO; Counter, Synchronous and Asynchronous Counter, Limitations of Asynchronous Counter, Frequency Division Counter.

Unit 15 Memory Types
Random Access Memory (RAM), Read Only Memory (ROM), Static RAM, Dynamic RAM, Volatile and Non-Volatile memory

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MCA (S1) 03: Computer Programming using C

Unit 1: Introductory Concepts
Basic definition of Pseudo Code, algorithm, flowchart, program

Unit 2: Elements of C Programming
Characters used in C, Identifiers, Keywords, Tokens, Constants, Variables, Types of C variables, Receiving input and output

Unit 3: Variables and Data types
Integer, character floating point and string; Initialization of variable during declarations; Symbolic Constants, type conversion in assignment

Unit 4: Operators and Expressions
Expression in C, Different types of operators: Arithmetic, Relational and Logical, Assignment, Conditional, Increment and decrement, Bitwise, Comma and other operator (size of, period etc). Precedence and associatively of operators, type casting

Unit 5: I/O Functions
Header Files (stdio, conio), Formatted Input/Output Functions (scanf, printf), Escape Sequences, Character Input/Output Functions (getch, getchar, putchar, gets, puts, getche, clrscr)

Unit 6: Preprocessor Directives
Features of C preprocessor, Macro expansion, Macros with arguments, #if and #elif directives,

Unit 7: Conditional Statements
Conditional Statement- if, if- else, nested if-else, switch-case; break, continue, goto

Unit 8: Loop Control Structures
Concept of Loops, Types of loop: while, do-while, for; nested loops

Unit 9: Storage Class
Automatic, External, Static, Register, Scope and lifetime of variables, Macro, Preprocessor directive

Unit 10: Arrays
Array, Array Declaration, 1-Dimensional array, 2-Dimensional array

Unit 11: Strings
String, String Handling Functions: strlen(), strcmp(), strcpy(), strrev(), strcat(), etc

Unit 12: Functions
Function, Function declaration, Function definition, Function call, Formal and Actual parameter, Recursive function

Unit 13: Pointers
Pointer, Pointer declaration, Passing pointer to a function, Pointer and one-dimensional arrays, Dynamic memory allocation

Unit 14: Structures and Union
Structure Declarations, Definitions, Defining your typedef, Array of Structure, Pointer to Structure. Union Declaration, Definition, Declaration, Uses

Unit 15: File Handling
Concept of File, File Pointer, File Opening in various modes, closing a file, reading and writing on files, Formatted Input/Output, fseek(), ftell(), rewind()

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MCA (S1) 04: Fundamentals of Networking and Web Technology

Unit 1: Introduction to Computer Network
Goals of Computer Network, Types of Computer Network: LAN, MAN, WAN, LAN Transmission Methods, Peer-to-Peer LANs, Broadcast and Point-to-Point Networks, Connection-Oriented and Connection-Less Services.

Unit 2: Network Topology
Definition of Network Topology, Types of Network Topology: Bus, Ring, Star, Mesh, Tree.

Unit 3: Data Communication Modes
Introduction to Signals and Systems, Types of Communication (Analog, Digital), Modes of Communication (Simplex, Half-Duplex, Full-Duplex), Modulation.

Unit 4: Network Devices
Network Interface Card (NIC), Modem, Switch, Router, Gateway.

Unit 5: Data Transmission
Parallel Transmission, Serial Transmission, Bandwidth, Baud length, Switching Techniques: Circuit Switching, Message Switching, and Packet Switching.

Unit 6: Network Models
ISO-OSI Reference Model: Functions of each Layer; Various Terminology used in Computer Network; Connection-Oriented and Connectionless Services, TCP/IP Reference Model, Comparison of ISO-OSI and TCP/IP Model.

Unit 7: Transmission Media
Transmission Medium, Guided Media: Coaxial Cable, Twisted Pair, Fiber Optics Cable: Unguided Media: Radio Waves, Bluetooth, Infrared, Microwave, Satellite, Wireless LANs (IEEE 802.11).

Unit 8: Internet
Definition of Internet, Internet Architecture, Peer-to-Peer, Client-Server, Accessing Technique, Internet Service Providers, Organization of Internet, Internet Protocol Suite, IP Address, Domain Name System, Uniform Resource Locators (URL), Socket, Application of Internet.

Unit 9: Word Wide Web
Web Page, Web Browsers, Web Server, Web Search Engines, Web Cookies, Technologies in WWW.

Unit 10: Introduction to HTML
Basics of HTML, HTML Editor, HTML Tags, Document Structure Tags, Formatting Tags, Hyperlink and Image tags

Unit 11: HTML Lists and Tables
HTML Lists: Unordered, Ordered, Definition Lists; HTML Table tags;

Unit 12: Advanced HTML Tags
Frame tags, HTML Form, Additional Advanced HTML Tags.

Unit 13: Introduction of XML
Introduction to XML, Comparison of HTML and XML, XML Basics, Introduction to DTD

Unit 14: Introduction to CSS
Cascading Style Sheets (CSS), Inline Style, Embedded Style, External Style Sheet, Imported Style Sheet, Ruleset, @ rule, Class Selector, ID Selector, Contextual Selector, Attribute Selector, CSS Properties – background properties, text properties, and border properties

Unit 15: Dynamic HTML]
Dynamic HTML, Document Object Model, Features of DHTML

MCA (S2) 05: Computer Organization and Architecture

Unit 1: Basic organization of the computer
Basic organization of the computer and block level description of the functional units from program execution point of view; Fetch, decode and execute cycle

Unit 2: Digital Components
Half adder, Full Adder, Half subtractor, Full subtractor, Coder-Decoder, Multiplexer, De-multiplexer, Magnitude Comparator, Flip-Flops, Counter, Register

Unit 3: Data Representation
Data representation, computer arithmetic and their implementation; control and data path, data path components, design of ALU and data path, control unit design.

Unit 4: Computer Arithmetic
Integer representation, sign magnitude representation, twos complement representation, integer arithmetic

Unit 5: Instruction Sets
Elements of a machine instruction, instruction representation, Simple instruction format, Instruction types, number of addresses, Types of operands, Types of operations. Different Instruction Formats, Instruction Types, Instruction Execution, Assembly language notation.

Unit 6: Addressing modes
Addressing: Immediate, Direct, Indirect, Registrar, Registrar indirect, Relative Index.

Unit 7:Input-Output Organization
Different I/O techniques (Programmed I/O, Interrupt-Driven I/O), DMA (Direct Memory Access), I/O Processors

Unit 8: Introduction to Cache and Virtual Memory
Memory Hierarchy, Semiconductor memories, internal organization of typical RAM and ROM Memory, Switches, Cache memory, Cache memory access techniques; Mapping functions, Virtual memory, Locality of reference, Paging, Cache Coherence Problem

Unit 9: Memory and I/O access
Memory Read Write operations, Concept of handshaking, Polling Techniques (Serial and Hub Polling) and Interrupt driven I/O, Priority and Daisy Chaining Technique, Introduction to Memory Mapping.

Unit 10: Memory and I/O Interfacing
I/O processor, Priority Encoder, Device Scheduler, Interfacing with the I/O Devices, keyboard, printer and display interfaces

Unit 11: External Memory
Magnetic Disk, Magnetic read write operation, sector, track, inter track and inter sector gap, cylinder, fixed head disk, seek time, access time, transfer time, rotational delay, RAID, Optical memory, Magnetic tap.

Unit 12: Processor structure and Function
Processor organization: Fetch instruction, Interpret instruction, fetch data, process data, write data, Registrar organization, Control and status registrar, Instruction cycle, Instruction pipelining (definition only)

Unit 13: Introduction to Parallel Processing
Introduction to Pipelining and Basics of Parallel Processing, Scalable Architecture

Unit 14: Introduction to CISC and RISC Architecture
CISC (Complex Instruction Set Computers), RISC (Reduced Instruction Set Computers), Examples of CICS and RISC

Unit 15: Parallel Architectures
SISD, SIMD, MISD, MIMD, Scalar, Flynn's Classification of Computer Architecture, Vector, superscalar and pipelined processor, Pipelining, Instruction pipeline, pipeline bubbles, Hazards: - resource conflicts, data dependency, branch difficulty. Vector computing, arithmetic pipeline, vector and scalar register, chaining, scatter gather operations, vector-register processor, memory-memory vector processor. Array processor

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MCA (S2) 06: Data Structure through C Language
DETAILED SYLLABUS

Unit 1: Introduction to Data Structure
Basic concept of data, data type, Elementary structure, Arrays: Types, memory representation, address translation functions for one & two dimensional arrays and different examples.

Unit 2: Algorithms
Complexity, time-Space, Asymptotic Notation

Unit 3: Linked List
Introduction to Linked List, representation of single linked list, linked list operations: Insertion into a linked list, deletion a linked list, searching and traversal of elements and their comparative studies with implementations using array structure.

Unit 4: Stack
Definitions, representation using array and linked list structure, applications of stack.

Unit 5: Queue
Definitions, representation using array, linked representation of queues, application of queue.

Unit 6: Searching
Linear and Binary search techniques, Advantages and disadvantages, Analysis of Linear and Binary search

Unit 7: Sorting
Sorting algorithms (Complexity, advantages and disadvantage, implementation), bubble sort, insertion sort, selection sort, quick sort

Unit 8: Trees
Definition and implementation: Binary Tree, Tree traversal algorithms (inorder, preorder, postorder), postfix, prefix notations; Binary Search Tree: Searching in BST, insertion and deletion in BST.

Unit 9: Dictionary ADT
Search trees, balancing of search trees – AVL trees, Red-Black trees, multi way search trees, 2-3 trees, splay trees, Insertion and Deletion in each of the above data structures, Hashing.

Unit 10: Advance Sorting and Selection Techniques
Heap sort, Shell sort, sorting in linear time, Counting sort, Radix sort. Medians and order Statistics Selection and Adversary arguments. Lower bound on sorting

Unit 11: Priority Queue ADT
Heaps-extended priority queue, min(max) heaps, binomial heap, fibonacci heap and its amortized analysis.

Unit 12: Partition ADT
Union-find algorithms through weighted merge and path compression

Unit 13: Data Structure for external storage operations
B-tree, insertion and deletion in B-trees, external sorting, B^+ tree

Unit 14: Red Black Tree
Definition, properties, Creation, Insertion, left and right rotation, balancing red black tree, deleting node from red black tree

Unit 15: Graph
Introduction to Graph, Graph representation: adjacency matrix, adjacency list, Traversal of graph: depth first search and breadth first search.

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MCA (S2) 07: Fundamentals of Database Management System

Unit 1: File Structure and Organization
Data and Information, Concept of Field, Key Field; Records and its types, Fixed length records and Variable length records; Files, operation on files, Primary file organization.

Unit 2: Database Management System
Definition of DBMS, File processing system vs. DBMS, Advantages and Disadvantages of DBMS, Database Architecture, Data Independence, Data Dictionary, DBMS Language, Database Administrator.

Unit 3: Data Models
Data Models: Object Based Logical Model, Record Base Logical Model, Relational Model, Network Model, Hierarchical Model.

Unit 4: Entity-Relationship Model
Entity Set, Attribute, Relationship Set, Entity Relationship Diagram (ERD), Extended features of ERD.

Unit 5: Relational Databases
Relational data model; Terms: Relation, Tuple, Attribute, Cardinality, Degree, Domain; Keys : Super Key, Candidate Key, Primary Key, Foreign Key;

Unit 6: Relational Algebra
Operations: Select, Project, Union, Difference, Intersection, Cartesian Product, Natural join.

Unit 7: SQL (Part I)
Introduction of SQL, characteristic of SQL, Basic Structure, DDL Commands, DML, DQL, SELECT Statement, WHERE Clause, Useful Relational Operators, Aggregate Functions, SUM Function, AVG Function.

Unit 8: SQL (Part II)
Compound Conditions and Logical Operators, AND Operator, OR Operator, Combining AND OR Operators, IN Operator, BETWEEN Operator, NOT Operator, Order of Precedence for Logical Operators, LIKE Operator, Concatenation Operator, Alias Column Names, ORDER BY Clause, Handling NULL Values, DISTINCT Clause

Unit 9: Normalization of Database
Introduction to Normalization, Anomalies of un-normalized Database, Normalization of Database: 1NF, 2NF, 3 NF, BCNF.

Unit 10: Database Design
Design of Relational Database, Functional Dependency Diagram, Dependency-preserving property , lossless join property , algorithms to ensure dependency -preserving property and lossless join property.

Unit 11: System Implementation Techniques
Query processing and optimization- translation between SQL queries and relational algebra;

Unit 12: Transaction Processing
Transaction and System concepts, Desirable properties, Schedules and Recoverability

Unit 13: Concurrency Control
Locking Techniques, Concurrency Control based on timestamp ordering, Multiversion Concurrency Control Techniques

Unit 14: Database Recovery
Concepts and techniques, recovery in multi database systems

Unit 15: **Security and Authentication**
Issues, access control techniques, introduction to multilevel security

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MCA (S2) 08: Project I

The guidelines for the project are enclosed in Annexure III.

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MCA (S3) 09: Introduction to Discrete Mathematics and Formal Languages and Automata

PART I: Discrete Mathematics

Unit 1: Sets, Relations and Functions
Sets – the Empty Set, Finite and Infinite Set, Equal and Equivalent set, Subsets, Power set, Universal set, Venn diagram, Complement of a set, set operations; Concept of relation: identity and inverse relation, types of relation, equivalence relation; Concept of function: identity and constant function, types of function.

Unit 2: Lattices
Lattices as partially ordered sets, their properties. Lattices and algebraic systems. Sub lattices, direct products and homomorphism. Some special lattices for example complimented and distributive lattices.

Unit 3: Propositional Logic
Statements, logical connectives, truth tables; Tautologies, contradictions, logical equivalence, Applications to everyday reasoning

Unit 4: Boolean Algebra
Boolean Algebra, Relation of Predicate Calculus to Boolean algebra

Unit 5: Counting Principles
The Pigeonhole principle - counting; Permutation and Combination: Definition of Permutation and combination, Simple application of permutation and combination, Principle of Inclusion-Exclusion

Unit 6: Basic Algebraic Structure
Binary operations, identity and inverse of an element, group, subgroup, coset, cyclic group, normal subgroup, quotient group; Ring, Commutative Ring, Integral domain and Field

Unit 7: Graph Theory
Basic concepts- finite and infinite graphs, incidence and degree, isolated and pendant vertices, null graph; Paths and Circuits- isomorphism, subgraphs, walks, connected and disconnected graphs and components, Euler graphs, Bi-partite graphs, Hamiltonian paths and circuits;

Unit 8: Trees
Trees, Properties of trees, distance and centers, rooted and binary trees, on counting trees, spanning, fundamental circuits, spanning trees in weighted graphs; Cut-sets- properties, connectivity and separability, network flows; Matrix representation of graphs- incidence matrix, submatrices, circuit matrix, cut-set matrix, path matrix, adjacency matrix;

PART II: Formal Languages and Automata

Unit 9: Mathematical preliminaries
Set, Relations and Functions; Properties of Relations, Closure of Relations, Symbols and Alphabets, Strings and their properties, Languages, Principle of Induction.

Unit 10: The Theory of Automata
Definition of Automaton, Finite Automata, Transition Systems, Properties of Transition Functions, Acceptability of a String by a Finite Automata, Finite Automata with Epsilon-transitions;

Unit 11: Types of Finite Automata
Deterministic Finite Automata (DFA), Non-Deterministic Finite Automata (NFA); The Equivalence of DFA and NDFA; Minimization of Finite Automata; Application of Finite automata;

Unit 12: Formal languages
Basic Definition, Definition of a Grammar, Derivation and language generated by a grammar, Chomsky Classification of Languages;

Unit 13: Regular Expressions and Regular Grammars
Regular Set and Regular Grammars; Closure Properties of Regular Languages ; Regular Expressions; Relationship between the Finite Automata and Regular Expressions; The Pigeon-hole principle; Applications of Regular Expressions;

Unit 14: Context-Free Grammars and Languages
Context-Free grammars; Derivation tree, Parse trees; Applications; Ambiguity in Grammars and Languages

Unit 15: Properties of Context-Free Languages
Normal forms for CFGs; The pumping lemma for CFGs; Closure properties of CFL

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MCA (S3) 10: Object-Oriented Programming through C++

Unit 1: Introduction to Object-Oriented Programming
Basic concept of OOP, Comparison of Procedural Programming and OOP, Benefits of OOP, C++ compilation, Abstraction, Encapsulation, Inheritance, Polymorphism, Difference between C and C++

Unit 2: Elements of C++ Language
Tokens and identifiers: Character set and symbols, Keywords, C++ identifiers. Variables and constants: Integers & characters, Constants and symbolic constants, Dynamic initialization of variables, Reference variables, Basic data types in C++, Streams in C++, scope resolution operator

Unit 3: Operators and expressions
Operators, Types of Operators in C++, Precedence and Associativity, Manipulators, Enumerated data type, storage classes

Unit 4: Decision and Control Structures
if statement, if-else statement, switch statements, Loop: while, do-while, for; Jump statements : break, continue, goto

Unit 5: Array and Structure
Arrays, structure, unions, Runtime memory management: new and delete operator

Unit 6: Pointer
Introduction, Address operator, pointer variable, pointer definition, pointers and parameter passing, void pointer, pointer arithmetic, Runtime memory management: new and delete operator, Pointers to pointer, Passing address of a pointer, Array of Pointers, Pointers to functions

Unit 7: Functions
main() function, components of function : prototype, function call, definition, parameter; passing arguments; types of function, inline function, function overloading

Unit 8: Introduction to Classes and Objects
Classes in C++, class declaration, declaring objects, Defining Member functions, Inline member function, Array of objects, Objects as function argument, Static data member and mmber function, Friend function and friend class.

Unit 9: Constructors and Destructors
Constructors, Instantiation of objects, Default constructor, Parameterized constructor, Copy constructor and its use, Destructors, Constraints on constructors and destructors, Dynamic initialization of objects

Unit 10: Operator Overloading
Overloading unary operators: Operator keyword, arguments and return value; Overloading Unary and binary operators: arithmetic operators, manipulation of strings using operators, Type conversions.

Unit 11: Inheritance
Derived class and base class: Defining a derived class, Accessing the base class member, Inheritance: multilevel, multiple, hierarchical, hybrid; Virtual base class, Abstract class.

Unit 12: Virtual Functions and Polymorphism
Virtual functions, Pure virtual functions; Polymorphism, Categorization of polymorphism techniques: Compile time polymorphism, Run time polymorphism.

Unit 13: File Handling
File classes, Opening and Closing a file, File modes, Manipulation of file pointers, Functions for I/O operations

Unit 14: Templates
Iintroduction, Function template, Function template overloading, Class templates, Template arguments

Unit 15: Object Oriented Design
Object Oriented Design Approaches, Object Modeling Techniques (OMT) tools: Object Model, Dynamic Model, and Functional Model. (Object Diagram, State Diagram, and DFD), Phases of Object-Oriented Development: Object Analysis, System Design, Object Design

MCA (S3) 11: Operating System

Unit 1: Review of Computer Organization
Major Subsystems, I/O Organization, Memory Organization, Bus Organization.

Unit 2: Introduction to Operating System
Definition of Operating System, Batch System, Multi-Programmed System, Time-Sharing System, Single User Operating System, Multi-User Operating System.

Unit 3: Processes
Process: process models, process hierarchies, process states; Threads: use, design issues of thread; Types and Application.

Unit 4: Interprocess Communication
Interprocess communication, race conditions, critical-sections, mutual exclusion, solution to race condition, disabling interrupt, Peterson's solution, sleep & wake up (The Producer Consumer Problem), Semaphores

Unit 5: Scheduling
Basic concepts, primitive and non-primitive scheduling, types of scheduling - batch, interactive and real-time, scheduling algorithms, goals of scheduling algorithms, first come first serve, shortest job first and round robin scheduling.

Unit 6: Deadlocks
Definition of deadlock, principles of deadlock (deadlock conditions & modelling), deadlock detection, recovery & prevention, deadlock avoidance (banker's algorlithm)

Unit 7: Memory Management
Multiprogramming: fixed partitions, relocation and protection; Swapping and its basic concepts; Virtual Memory: Basic concepts, Paging and Page tables, Page Replacement Algorithms (FIFO, LRU; Cache Memory.

Unit 8: Memory Mapping
Associative Mapping, Set-Associative Mapping, Block Set-Associative Mapping, DMA.

Unit 9: File System
Definition of File, File naming, File types(directory, regular), Sequential access and Random access files, File attributes, Operations on file, Hierarchical directory structure, Path name(relative and absolute), Operation on directories, File system implementation techniques.

Unit 10: I/O Management
Basic principles I/O Operations, I/O Devices, Device controllers, DMA, Principles of I/O Software, its goals, Interrupt Handlers, Device Drivers.

Unit 11: Protection
Needs for protection, domain of protection, Example in UNIX, access matrix, Implementation of Access matrix

Unit 12: Security
The security problem, Authentication, Password, password vulnerabilities, Encrypted password, One time password(OTP), Biometrics and its types, Intrusion detection (definition only).

Unit 13: Multiprocessor Systems
Types of Multiprocessor Operating Systems, Multiprocessor OS Functions and Requirements, Multiprocessor synchronization

Unit 14: Distributed Operating Systems
Distributed Processing, Coping with Failures Models of Distributed systems, Remote procedure calls, distributed Shared Memory, Distributed File Systems.

Unit 15: Introduction to Multiprogramming System
Queue management, I/O supervisors, memory management. File system, Disk and Drum Scheduling.

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MCA (S3) 12: System Analysis and Design

Unit 1: System Concept
System definition, Characteristics of a system: Organization, Interaction, Interdependence, integration, Elements of a system: inputs and outputs, Processors, control, feedback, environment, boundaries and interface, Types of systems: Physical or abstract system, open or closed system.

Unit 2: System Development Life Cycle
Introduction, Recognition of need, Feasibility study, Analysis, design, implementation, post implementation and maintenance, consideration for candidate system, prototyping,

Unit 3: Role of System Analyst
Introduction, Interpersonal skill, academic and professional qualification, multifaceted role of the analyst, analyst/user interface, conflict resolution, place of analyst in the MIS organization

Unit 4: System Planning and Initial Investigation
Introduction, bases for planning in system analysis, dimensions of planning, strategic MIS planning, Managerial and operational MIS planning, initial investigation, needs identification, determining the user's information requirements, background analysis, fact finding, review of written documents, on site observations

Unit 5: Information Gathering
Introduction, types of information needed, information about the organization, information about user staff, information about work flow, origin of information, review of literature, procedures and forms, interviews and questionnaires

Unit 6: Tools of Structured Analysis
Introduction, Data flow diagram (DFD), DFD symbols, constructing a DFD, data dictionary, structured English, decision tree, decision table

Unit 7: Feasibility Study
Introduction, system performance definition, statements of constraints, identification of specific system objectives, feasibility consideration: economic feasibility, technical feasibility, behavioral feasibility, steps in feasibility analysis, feasibility report

Unit 8: Cost/Benefit Analysis
Introduction, data analysis, cost and benefit categories, procedure for cost/benefit determination

Unit 9: The Process and Stages of System Design
Introduction, The process of design : Logical and physical design, design methodologies, structured design, functional decomposition, Forms driven methodology, HIPO and IPO chart

Unit 10: Input/Output and Form Design
Introduction, Input design, input data, source data, input media and devices, online data entry, formatted form, screen design, output design, form design, requirements of form design, types of form, box design

Unit 11: Database Design
Introduction, objective of database, key terms in database, Logical and physical views of data, schemas and subschemas, Types of relationships, Types of data structure : hierarchical, network, relational, entity and attributes, role of dataset administrators, Nornalization

Unit 12: System Testing
Introduction, Need for system testing, nature of test data, test plan, activity network for system testing, types of system test

Unit 13: Quality Assurance
Introduction, quality factor specification, levels of quality assurance, software requirement specification, software design specification.

Unit 14: Implementation
Introduction, conversion, activity network for conversion, file conversion, creating test files, training aids

Unit 15: Project Scheduling
Introduction, reason for system failure, project management, Planning tools: Gantt charts, program evaluation and review techniques (PERT), project management software.

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MCA (S4) 13: Programming in Java

Unit 1: Introduction to JAVA
An overview of JAVA, Basic features of Java, JAVA Environment, Installing the Java SDK, Writing Java Programs

Unit 2: Operators and Assignments
Introduction, Assignment operator, Comparison Operators, Instance of Comparison, Arithmetic operators, Shift operator, Bitwise operator, Logical operator, bitwise operator, conditional operator, casting.

Unit 3: Programming Basic
Java Token & Keywords, Constants, Data types; Declaring a variable, The scope and lifetime of variable, Various Operators, Input/Output statements Decision Making and Control Statements : if statement, If-else, else-if, switch statement; for, while, do-while statements

Unit 4: Class in Java
Class fundamentals: Defining class, Accessing class members, Declaring objects, Passing Arguments to Methods, Returning Multiple Values from methods, Modifiers

Unit 5: OOP in Java
Class fundamentals: Defining class, Accessing class members, Declaring objects, Constructors, copy constructor; Passing Arguments to Methods, modifiers, Inheritance: the super class, Multilevel Inheritance, Final and abstract keyword, Static Members

Unit 6: Arrays, Strings and Vectors
Declaring Arrays, Creating Arrays, Initializing Arrays, Multi-Dimensional Arrays, Strings: string arrays, string methods, String Buffer class, Vectors

Unit 7: Interfaces and Packages
Interfaces: Defining an Interface, Implementing interfaces, Applying Interfaces, Packages: Defining a package, Accessing and Importing Packages

Unit 8: Threads
Introduction, new threads, creating new threads by extending the thread class, creating a thread by implementing Runnable Interface, Threads in the Running State, Sleeping and Interruptions, Signaling with wait, notify

Unit 9:The java.lang.Math class
Introduction, Methods of the java.lang.Maths: abs, ceil, floor, max, min, random, round, sin, cos, tan, sqrt, exp, log, pow.

Unit 10: Exception Handling
Exception Handling fundamentals, Exception types, Using *try* and *catch,* built-In exceptions in Java, User-defined exception

Unit 11: File Handling
I/O Basics: Streams, The Stream classes, The predefined streams, Reading console input, Writing console output, Reading and writing files

Unit 12: Introduction to Applets
Applets and the World Wide Web, The Applet Class, Applets and HTML , The Life Cycle of an Applet, Using Window Components, Event Handling, Adding Audio and Animation

Unit 13: AWT and Swings
AWT Basics, AWT Components, Event Handling, Application and Menus; Introduction to Swings, Swing Components, Event Handling, Display text and image in a window, Layout manager

UNIT 14: Introduction to JDBC
Basic steps to JDBC, API, JDBC Drivers, Connection Management, JDBC Design Considerations, Two Tier and Three Tier client server model, Result Set, Prepared statement and callable statement, Result Set Meta Data Object.

Unit 15: Database programming using Java
Keeping MySQL or NoSQL as backend and using java as front end good GUI should design to insert, update and delete record on a database table

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MCA (S4) 14: Computer Graphics

Unit 1:Introduction to Computer Graphics
Definition, Application Areas of Computer Graphics (CAD, CAM, Education and Training, Entertainment, Image Processing, Computer Art etc.), Graphical User Interfaces (GUI)

Unit 2: Graphics Systems
Cathode Ray Tubes, Random Scan Displays, Raster Scan Displays, Color CRT Monitors, Flat-Panel Displays (Plasma-Panels, Liquid Crystal Displays(LCD), Electroluminescent displays), Graphics Software (GKS, PHIGS)

Unit 3:Line Drawing Algorithms
Points and Lines, Line Drawing Algorithms (DDA Algorithm, Bresenham's Line Algorithm)

Unit 4:Circle and Ellipse Drawing Algorithms
Circle drawing algorithms, Ellipse Drawing algorithms

Unit 5: Filled area algorithms
Filling (Scan-Line Polygon filling, Inside outside tests, Boundary-fill and Flood-fill algorithm)

Unit 6:Transformations
Basic 2-D Transformations (Rotation, Reflection, shearing, scaling), Homogeneous Coordinate Representation, Translation, 3-D transformations

Unit 7: 2-D Viewing
2-D Viewing: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions

Unit 8: Clipping Algorithms
Line and polygon clipping algorithms (Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm)

Unit 9: 3-D Object representation
3-D Object representation: Polygon surfaces, quadric surfaces, spline representation, Basic illumination models, polygon rendering methods

Unit 10: Bezier and B-spline curves
Hermite curve, Bezier curve and B-spline curves, Bezier and B-spline surfaces

Unit 11: Projections
Projection Classification, Parallel projections, Perspective projections (One point, Two point), Hidden Layer Projection

Unit 12: 3-D Geometric transformations
Translation, rotation, scaling, reflection and shear transformations, composite transformations

Unit 13: 3-D viewing
Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping

Unit 14: Basics in Animation
Animation Basic, Computer Animation, Principles of Animation, Types of Animation, Animation Software (Maya, etc) and Hardware, Common Terms in Animation

Unit 15: Animation Designing
Design of Animation sequence, Morphing, Application of Computer Animation, Future of Animation

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MCA (S4) 15: Linux System Administration

Unit 1: Introduction to System Administration
Introduction to System Administration, Role of System Administrator, Qualities of good System Administrator, System Administration Common administrative tasks, identifying administrative files – configuration and log files

Unit 2: Introduction to LINUX Operating System
Basic idea on Proprietary, Open Source, Free Software etc, Basic Features of the Linux operating system, Introduction of Various Linux Distribution (Red Hat Enterprise Linux, Cent OS, Fedora Projects, Debian Linux, Ubuntu, SUSE etc.)

Unit 3: Installation of LINUX Operating System
Installation Requirements, Partitioning the Hard drive in Linux, Installing the Linux system: Using Live CD, Virtual Machine, Direct Installation, Installing and Configuring software in Linux

Unit 4: LINUX Kernel
Linux kernel and device drivers, System Startup and Shutdown, Standard I/O, Standard error, Redirection and Piping

Unit 5: Basics of LINUX File System
Basics of Linux file system - File system types (ext3, ext4, xfs, jfs, ReiserFS, iso9660 etc.), Boot block, Super block, Inode table, Data blocks, How Linux access files, storage files, Linux standard directories, LILO, GRUB Boot Loader, three basic types of files (ordinary or regular, special or device and directory), I-nodes and file attributes, init and run levels

Unit 6: File organization
Files and File System (File Types and Permissions, Links, Size and Space, Date and Time); Working with Files: Reading Files, Searching for files, Copying, Moving, Renaming, Deleting, Linking, and Editing Files; Absolute and Relative path names, File system Mounting and Unmounting, Organization of the file tree, Standard directories and their contents, Disk related commands, checking disk free spaces.

Unit 7: LINUX File Handling Commands
Files and Directory handling Commands - ls, cd, cp, mv, rm, mkdir, rmdir, pwd, Commands for Creating and Viewing ordinary files – cat, more, less, pg

Unit 8: LINUX Filter Commands
Filter Commands – wc, head, tail, cut, tr, top, grep (with regular expressions),. Other commands –tar, unzip, nice, kill, netstat. Setting user and group ownership of files and Access permissions – chmod, chown, chgrp commands

Unit 9: LINUX Shells
Various types of Shell available in Linux, Comparisons between various Shells, Study of different Linux Shells (sh, bash, csh, zsh), Environment variables, Shell script basics (examples

of some simple shell programming), Shell programming in bash, read command, conditional and looping statements, case statements, parameter passing and arguments, Shell variables, system shell variables, shell keywords, creating Shell programs for performing various tasks.

Unit 10: Process
Services and Process, Basic commands for starting and stopping processes, Basic process attributes and their role in Access control. Examining the list of running processes on the system and understand the data presented there. Background process, Job control, Crontab file format, Backup and Restore procedure

Unit 11: Printing Jobs
Submit a print job, check the status of a print job, cancel a print job, configuring the Print Queue, Selecting the Print Driver, Editing the Printer configuration

Unit 12: System Administration Tasks
Getting Started: Login process, Creating Users Account and Group, Getting Help, Understanding the "root" account, Managing user accounts-adding, modifying and removing User accounts, changing permissions and ownerships, Creating and managing groups, modifying group attributes, becoming super user using su; limited su (sudo) Changing Password, System monitoring and logging, Monitoring memory usage, disk space usage and I/O activity, Temporary disable user's accounts, creating and mounting file system, checking and monitoring system performance file security & Permissions, Getting system information with uname, host name, disk partitions & sizes, users, kernel. Backup and restore files, reconfiguration hardware with kudzu, installing and removing packages in Linux. Configure X-windows starting & using X desktop. KDE & Gnome graphical interfaces, changing X windows settings.

Unit 13: Networking in LINUX
Installation and configuration of a simple LAN; Installation and configuration of: Proxy server(Squid), DNS server(BIND), Mail server, Web server(Apache), File server(Samba), DHCP server; Installation and configuration of a SSH server and client; Installation and configuration of FTP server and client, rules governing IP address classes and netmasks, Network Address, Netmask and Gateway configuring Interface with ifconfig, ping, netstat, traceroute, telnet, understanding the significance of the /etc/services file and well known port numbers

Unit 14: Network Protocols
Basics of configuring NFS, NIS, DNS, FTP, Squid Proxy, DHCP server, ip tables and firewall

Unit 15: Basic Network Security Issues
Introduction to Basic Network Security Issues, Packet Snifflers, DOS Attacks, Linux Kernel Firewalling, Virtual Private Networks

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MCA (S4)16: Fundamentals of Management
4 credits: 120 hours of learning

Unit 1: Introduction to Management
Definitions and Functions of Management, Characteristics of Management, Levels of Management, Managerial Skills, Importance of Management, Models of Management

Unit 2: Theory of Management
Scientific Management Approach, Administrative Management Approach, Behavioral Management Approach, Modern Management Theories

Unit 3: Forms of Business
Single Ownership – Advantages and limitations, Partnership – Types of Partners – Advantages and limitations, Joint Stock Company – Formation of Joint Stock Company – Advantages and limitations; Co – operative Societies – Types of Co – operatives – Advantages and limitations, Public Corporations – Advantages and limitations.

Unit 4: Introduction to Organization
Meaning of Organizing and Organization, Organization process , Functions of an Organization, Principles of Organization, Formal and Informal Organizations - Merits and Demerits, System View of Organization (Open / Closed)

Unit 5: Organizational Structure
Meaning of Organization Structure, Druker's and Mintzberg Approach to the Organizational Structure, Line Organization – Merits and Demerits, Functional Organization – Merits and Demerits, Line and Staff Organization – Merits and Demerits, Committee Organization – Merits and Demerits.

Unit 6: Dynamic Organizational Structure and Departmentation:
Definition of Dynamic Structure, Principles of Departmentation, Process of Departmentation, Four major types of Organization Structures : Functional Structure (Departmentation by Function), Divisional Structure (Departmentation by Product or Services), Hybrid Structure and Matrix Structure, Span of Control, Organization Structure in a Globalized World, Virtual or Networked Organizations.

Unit 7: Management of Human Resource
Concept of Human Resource Management, Functions of Human Resource Management, Human Resource Planning, Training and Development of human Resource, Job Analysis, Job Evaluation and Merit Rating.

Unit 8: Staffing in Organization:
Concept of Recruitment – Functions of Recruitment, Internal and External Recruitment, Recruitment policy. Recruitment Process: Meaning, Major sources of Recruitment - Employment Exchange, Advertisement in different Media, Internet / Job sites, Universities and Other institutes (Campus Interviews), Preliminary Screening of Applicants, Review of Application Forms/Blanks, Induction and Placement: Meaning of Induction Programme,

Objectives of Induction Programme, Components of an Induction Programme, Steps in an Induction Programme, Placement, Meaning of Staffing Costs, Areas of Staffing Costs.

Unit 9: Wages and Salary Administration
Objectives, Concept of Compensation, Reward, Wage Levels and Wage Structures, Wage determination Process, Wage administration rules, Principles of Wage and Salary Administration, Types of Wages – merits and demerits.

Unit 10: Motivation
Motivation – Introduction, Types of Motivation, Attitude Motivation; Group Motivation; Executive Motivation, Techniques of Motivation, Motivation Theories: Maslow's Need Hierarchy Theory, McGregor's Theory X and Theory Y, Fear and Punishment Theory.

Unit 11: Leadership
Introduction, Qualities of a good Leader, Leadership Style, Blakes and Mouton's Managerial Grid, Leadership Approach, Leadership Theories.

Unit 12: Control
Concept of Control, Characteristics of Control, Prerequisites of a Good Control System, Essential Features of a Good Control System, Types of Control, Process of Control, Methods of Control, Usages of Control, Importance of Control, Tools of Control.

Unit 13: Entrepreneurship – Introduction
Concept of Entrepreneur, Entrepreneurial Characteristics, Entrepreneurship Development, Need for Promotion of Entrepreneurship, Steps for establishing small scale unit.

Unit 14: Business Environment and Social Responsibility
Concept of Social Responsibilities of Business, Reasons for Social Responsibility, Advantages and Disadvantages for Social Responsible Organizations, Concept of the Business Environment , PEST analysis, SWOT analysis.

Unit 15: Management Information System
Data and Information, Need, function and Importance of MIS, Evolution of MIS, Organizational Structure and MIS, Computers and MIS, Classification of Information Systems, Information Support for functional areas of management, Organizing Information Systems.

MCA (S5) 17: Open Source Software

Unit 1: Installation to LaTeX
Installation of LaTeX, Understanding Latex compilation

Unit 2: Introduction of LaTeX
Basic Syntax, Writing equations, Matrix, Tables

Unit 3: Page Layout – I
Page Layout – Titles, Abstract Chapters, Sections, References, Equation references, citation, Table of contents

Unit 4: Page Layout – II
List making environments, Generating new commands, Figure handling, table & figure numbering, List of figures, List of tables, Generating index

Unit 5: Packages
Packages: Geometry, Hyperref, amsmath, amssymb, algorithms, algorithmic graphic, color, tilez listing

Unit 6: Classes
Classes: article, book, report, beamer, slides, letter

Unit 7: Applications of LaTex
Applications: Writing Resume, Writing question paper, Writing articles/ research papers, Presentation using beamer, inserting graphics, drawing graphics, putting equations like :

$$(x+a)^n = \sum_{k=0}^{n} \binom{n}{k} x^k a^{n-k},$$

$$(1+x)^n = 1 + \frac{nx}{1!} + \frac{n(n-1)x^2}{2!} + \cdots,$$

$$f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos\frac{n\pi x}{L} + b_n \sin\frac{n\pi x}{L} \right)$$

$$, e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots, -\infty < x < \infty$$

Unit 8: Installation of Scilab
Installation of Scilab (both windows & Linux)

Unit 9: Introduction to Scilab
Introduction to scilab, Basic syntax, Mathematical Operators, Predefined constants, Handling .sci files, Installation of additional packages e.g. optimization

Unit 10: Functions in Scilab
Built in functions, Complex numbers, Polynomials, Vectors, Matrix operations (functions like inv(), spec(), zeros(), ones(), eye(), rand(). Handling these data structures using built in functions. Functions

Unit 11: Conditional Statements in Scilab
Loops (for & while), Conditional statements

Unit 12: Graphics in Scilab
Graphics handling: 2D, 3D, Generating .jpg files, Function plotting, Data plotting, GUI in scillab, Plotting 2D graphs

Unit 13: Applications of Scilab
Applications: Numerical Linear Algebra (Solving linear equations, eigen values atc.) solving Ordinary Differential Equations, Numerical Analysis – iterative methods, Comparison with C/C++/Matlab

Unit 14: Introduction to Python
Introduction to Python, The procedure to install Python, How to open Python console

Unit 15: Basic Python Commands
Basic Python commands, Python programming

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MCA (S5) 18: Web Technology

Unit 1: Basics of Internet and Web
History of the Internet and the Web, The basics of Internet, World Wide Web Consortium (W3C), World Wide Web, Web page, Home page, Web site, Static, Dynamic and Active web page, Hypertext, hyperlink, Uniform Resource Locator (URL), Overview of Protocols – Simple Mail Transfer Protocol, Gopher, Telnet, Emails, FTP, Hyper Text Transfer Protocol (HTTP), Hypertext Transfer Protocol Secure (HTTPS), Client server computing concepts, MIME, Web Surfing, Domain Name System (DNS), TCP/IP the protocol of the Internet, Internet Protocol (IP) and the concept of IP Addresses. Internet Service Provider (ISP), Autonomous System (AS), Free and Proprietary Software

Unit 2: Web Client
Web Browser, Browsers e.g., Netscape navigator, Internet Explorer, Mozilla Firefox, Client-Side Scripting Languages- VB Script and Java Script, Active X control and Plug-ins

Unit 3: Web Sever
Web Server Architecture, Image maps, CGI, API web database connectivity-DBC, ODBC, Proxy Server

Unit 4: Introduction to HTML
Introduction to HTML, HTML and its components, Essential Tags, Tags and Attributes, Text Styles and Text Arrangements, Text, Effects, Exposure to Various Tags (DIV, MARQUEE, NOBR, DFN, HR, LISTING, Comment, IMG), Color and Background of Web Pages, Attributes of Image Tag, Hypertext, Hyperlink and Hypermedia, Links, Anchors and URLs, Links to External Documents, Document Object Model (DOM), Creating a simple web page

Unit 5: HTML Lists and Tables
Lists, Unordered Lists, Ordered Lists, Definition Lists, Tables, TABLE, TR and TD Tags, Cell Spacing and Cell Padding, Colspan and Rowspan

Unit 6: HTML Frames and Form
Frame, Frameset, FRAME Tag, NOFRAMES Tag, Forms, FORM and INPUT Tag, Text Box, Radio Button, Checkbox, SELECT Tag and Pull Down Lists, Hidden, Submit and Reset

Unit 7: Cascading Style Sheet
Cascading Style Sheets (CSS), Inline Style, Embedded Style, External Style Sheet, Imported Style Sheet, Ruleset, @ rule, Class Selector, ID Selector, Contextual Selector, Attribute Selector, CSS Properties – background properties, text properties, border properties, Creating a CSS file, Using CSS in a web page

Unit 8: Dynamic HTML
Dynamic HTML, Document Object Model, Features of DHTML, CSSP (Cascading Style Sheet Positioning) and JSSS (JavaScript assisted Style Sheet), Layers of Netscape, The ID Attribute, DHTML Events.

Unit 9: Introduction to JavaScript
Introduction, Language Elements: Data types, Identifiers, Expressions, Operators, Statement Functions, JavaScript - Comments, document write( ), console.log( ), Variables, length, substring, Conditional Statements - if, Loops - for, Functions. Creating a JavaScript file, Using JavaScript in a Web page

Unit 10: Objects in JavaScript
Objects: Window, Document, Form Objects, TextBox, TextArea, Button, Radio Button, Check Box, Select Objects, Date, Match, String Objects; Regular Expression, Arrays, HTML DOM and JavaScript - Finding HTML Elements, Changing HTML elements, DOM events,

Unit 11: AJAX Basics
Introduction, AJAX, XML http Request Object, AJAX Request, AJAX Response, AJAX Events, Adding Ajax Functionality in JavaScript, Adding Ajax Functionality to a Web Page

Unit 12: XML
XML - Declaration, Root Element, Child Elements, Element Attributes, Entity References, Comments

Unit 13: Introduction to PHP
Software Prerequisites - Installing Apache and PHP, Starting and Testing Apache, Testing PHP with phpinfo(), Installing MySQL, Starting and Testing MySQL, Installing the php-mysql Module, Checking the php-mysql Module

Introduction to PHP, Basic Programming Concepts of PHP: Variables, Data-types, Constants, Scope of Variables, Type of Variables, Type Casting, Operators, Operators Precedence, References, Connecting to MySQL using PHP, Building a Web Page using PHP

Unit 14: Control statements and Functions in PHP
Control Structures: Branching, If statement, Switch statement; Looping: for Loop, while Loop, do while Loop, for each Loop; Arrays, Functions: User Defined Functions, Built-in Function, Functions for Variables; Script Controlling Functions, Array Functions, Date and Time Functions, Mathematical Functions, String Functions, PHP Server Variables; Working with form, Uploading files to Web Server using PHP

Unit 15: Creating a Web Application – putting it all together
The MVC Design Pattern – Basic Web Architecture, MVC Architecture, Coding Considerations, Setting up our Development Environment, Building our MVC Framework, Building a PHP Application on our MVC framework

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MCA (S5) 19: Data Communication and Computer Networks

Unit 1: Introduction to Data Communication
Introduction, Signals, Types of Signal: Analog, Digital, Block representation of Data Communication System, Channel, Bandwidth, SNR.

Unit 2: Types of Data Communication
Data Communication, Parallel and Serial Communication, Modes of Communication: Simplex, Half Duplex, Full Duplex; Asynchronous and Synchronous Communication.

Unit 3: Digital Transmission Fundamentals
Digital Signal, Pulse Code Modulation, TDM, FDM, Detection and Correction of Transmission Errors (Parity and Hamming Code Technique), Data Compression and Encryption

Unit 4: Introduction to Computer Networks
Computer Network: Definition, Goals, Structure; Broadcast and Point-To-Point Networks; Types of Networks (LAN, MAN, WAN): Server Based LANs & Peer-to-Peer LANs), Network Topologies, Network Protocols (X.25, X.21, Stop and Wait) and Standards (OSI/ISO), Networking Switching Techniques.

Unit 5: Network Models
Network Reference Models, Design Issues of the Layer, Protocol Hierarchy, Functions of each Layer, TCP/IP Reference Model, Comparison of ISO-OSI and TCP/IP Model, Network Classes and Addressing Technique.

Unit 6: Physical Layer
Physical Layer: Properties, Applications and Limitations.

Unit 7: Data Link Layer
Data Link Layer, Flow Control, Access Protocol, Bridges and Switches, MAC, LLC, Frame, Frame Format, Error Detection and Correction: Type of errors, detection and correction of errors; Data Link Control and Protocol: Flow & error control, Stop-And -Wait ARQ, HDLC.

Unit 8: Network Layer
Network Layer, Routing Protocols, Internet Protocol (IP), IP Addresses, Sub-netting, Connection-Oriented & Connectionless Services.

Unit 9: Transport Layer
Process-To-Process delivery, User Datagram Protocol (UDP), Transmission Control Protocol (TCP): Characteristics, TCP Segment, Connection Establishment and termination.

Unit 10: Session Layer
Interhost/Intranet communication; Protocols-Remote Procedure Call (RPC), Session Establishment, Session Delivery and Session Termination, Token Management

Unit 11: Presentation Layer
Services - Data conversion, Translation, Encryption, Compression; Protocols - FTP, Telnet, DNS, SMTP, POP.

Unit 12: Application Layer
Client-Server Model, Socket and Socket Interface

Unit 13: Network Standard Protocol
FTP, Telnet, HTTP, Email Protocol, POP, SMTP, Browser, WWW, PING

Unit 14: Network Devices
Gateway, Bridge, Router, Switch, RS-32C, Network Interface Card (NIC), Network Adapters, Components of NIC, Functions of NIC, Types of NIC; Ethernet: Basic Features, Types of Ethernet.

Unit 15: Wireless LANs
Wireless LANs (IEEE 802.11), Architecture, MAC Sub Layer, Frame Format, Frame Types, PSTN, Satellite Network

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MCA (S5) 20A: Image Processing

Unit 1: Fundamental of image
Definition of image, Analog image, digital image, Advantages & disadvantages of digital image, digital image representation, pixel, neighbours of pixel

Unit 2: Image Sampling
Introduction, Theory of 2D sampling, violation of sampling criterion, quantization, Resolution, Anatomy of the human visual system

Unit 3: Digital Image
Classification of digital image : Raster image, vector image, Image types : Binary image, grayscale image, color image, multispectral image, hyper spectral image, Elements of image processing system : Image sensor, acquisition, CCD sensor, CMOS image sensor comparison of CCD and CMOS sensors, Digital camera, Image file format, GIF file format, JPEG, PNG, TIFF, PSD, EPS, BMP, Application of digital image processing

Unit 4: Image Transform
Introduction, need for transform, Image transform, classification of image transform ,Fourier transform, 2D discrete Fourier transform, Properties of 2D DFT: Separable, spatial shift property, periodicity, convolution, correlation properties, scaling property, rotation property

Unit 5: Image enhancement in spatial domain
Introduction, Image enhancement in spatial domain: point operation, mask operation, Types of point operation: Brightness modification, contrast adjustment

Unit 6: Image Histogram
Introduction, histogram equalization, procedure to perform histogram equalization

Unit 7: Filtering
Introduction, Spatial filtering, linear filtering, low pass filter, limitations of low pass filter, weighted average filter, Bartlett filter, Gaussian filter, Median filter, High pass filtering

Unit 8: Image enhancement in frequency domain
Introduction, Low pass filtering in frequency domain, High pass filter in frequency domain, Butterworth high pass filter, Homomorphic filter

Unit 9: Image Restoration
Introduction, Image degradation, Types of image Blur, Classification of Image Restoration technique, Image restoration model, Linear Image Restoration techniques, Pseudo Inverse filter, Wiener filter, Non Linear Image Restoration techniques : Iterative method, Maximum likelihood Method, Stochastic image restoration technique

Unit 10: Image noise
Introduction, classification of noise image: adaptive noise, Multiplicative noise, impulse noise, Median filtering, trimmed average filter

Unit 11: Image segmentation
Introduction, Classification of Image segmentation technique, Local and global segmentation, region approach to image segmentation, clustering technique, Image segmentation based on thresholding, Limitation, edge detection techniques, edge linking, Watershed transformation

Unit 12: Image compression
Introduction, Need for Image compression, Redundancy in images, Image compression scheme Huffman coding, Arithmetic coding, transform base coding, Vector quantization

Unit 13: Binary Image Processing
Introduction, Binarisation, Mathematical morphology, structuring element, Morphological image processing, Basic set theory, Logical operations, Standard binary morphological operations: Dialation, Erosion, Opening, Closing, Properties of Morphological operations

Unit 14: Color Image processing
Introduction, Color formation, Human perception of color, Color model: RGB model, CMY color model, HIS color model, YIQ color model, Histogram equalization of color image, Color Image filtering

Unit 15: Wavelet-based Image Processing
Introduction, Wavelet, Wavelet transform, 2D continuous wavelet transform, Discrete wavelet transform, Haar Wavelet, Filter bank, Embedded Image coding.

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MCA (S6) 21: System Software

Unit 1: Introduction to System Software
Definition and classification of system software

Unit 2: Machine Structure and machine languages
Introduction, General/Specific machine structure, Data, Instruction: Format, Types and Lengths, Machine language, Assembly Language.

Unit 3: Assemblers
Assembly language, Assembly process, Symbol Table, Mnemonic Table, Macros and macro processors

Unit 4: Linkers and loaders
Basic concepts, Static and dynamic linking, shared libraries, loaders, overlays. Case study of the UNIX linking system, Windows DLLs, OLEs

Unit 5: High-level Languages
Introduction, Importance of high-level languages, Features of High level languages, Data types and data structure, block structure

Unit 6: Macro language and the macro processor
Introduction, Features of Macro facility, Macro Calls within Macros (Nested Macros)

Unit 7: Introduction to compiler
Introduction: Types of compiler, Phases of a compiler, Languages and Grammar.

Unit 8: Lexical Analysis
The role of lexical analyzer, Signification of tokens, recognition of tokens, Finite automata, Lexical analyzer, Lexical analyzer generator (LEX)

Unit 9:Syntax Analysis
The role of Parser, context free grammar, Top-down and Bottom-up parsers, shift-reduce parser, operator precedence parsing, LL(1), LR parsers, Parser generator (YACC).

Unit 10: Syntax Directed Translation
Syntax directed definition, Construction of syntax tree, Top-down and bottom-up translation, recursive evaluators.

Unit 11: Semantic Analysis
Introduction, Type theory, Impact of type theory, Type checking: Static and dynamic, strong and weak, Type inference, Type conversion.

Unit 12: Code Generation
Intermediate code generation: intermediate languages, declarations, assignment statements; code generator, runtime storage management; Basics code optimization techniques.

Unit 13: Code Optimization
Introduction, Types of optimization, Factors Affecting optimization, problems of optimization, Data flow analysis, Loop optimization, Data Flow optimization, Functional Language Optimization.

Unit 14: Symbol Table
Introduction, Operation on symbol table, Symbol Table Implementation, Data structure for symbol table

Unit 15: Error detection and recovery
Introduction, Error representation, sources of errors, Lexical Phase errors, Syntax error detection and recovery

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MCA (S6) 22 A: Data Warehousing and Data Mining

Unit 1:Introduction to Data mining
Data mining, various types of Data, Data Mining Functionalities, Classification of Data mining Systems, Data mining Task Primitives, Integration of Data Mining System, Major issues in Data Mining

Unit 2: Introduction to Data Warehousing
Data Warehouse and DBMS, The need for data warehousing, Operational & Informational Data Stores, Data Warehouse Characteristics, Building a Data Warehouse, Design / Technical / Implementation Considerations, Data Warehouse role & Structure, The cost of warehousing data

Unit 3:Introduction to OLAP
Introduction to OLAP & OLTP, Difference between OLAP & OLTP, OLAP Operations

Unit 4:Data preprocessing
Data preprocessing, Data Summarization, Data Cleaning, Data Transformation, Data reduction, Concept Hierarchy, Structure

Unit 5:Multidimensional Data
Multidimensional Data Model, Schemas for Multidimensional Data (Star Schema, Snowflake Schema, Fact Constellation)

Unit 6:Data Warehouse Architecture
Data Warehouse Architecture, Data Warehouse Design, OLAP Three -tier Architecture, Indexing & Querying in OLAP, OLAM, Implementation from Data Warehouse to Data mining

Unit 7: Data mining knowledge representation
Task relevant data, Background knowledge, Interestingness measures, Representing input data and output knowledge, Visualization techniques

Unit 8:Attribute-oriented analysis
Attribute generalization, Attribute relevance, Class comparison, Statistical measures

Unit 9:Association Rule mining
Association Rule Mining, Market Basket Analysis, Apriori Algorithm, Mining Multilevel Association Rules, From Association Mining to Correlation Analysis

Unit 10: Classification
Introduction to Classification, Classification by Decision Tree, Attribute Selection Measure, Covering rules

Unit 11: Prediction
Introduction to Prediction techniques, Statistical (Bayesian) classification, Bayesian networks, Instance-based methods (nearest neighbor)

Unit 12: Evaluation
Training and Testing, Evaluating accuracy of a Classifier, Cross-Validation, Combining multiple models (Bootstrap, Boosting, Bagging)

Unit 13: Clustering
Introduction to Clustering, Classification of Various Clustering Algorithms, Partitioning methods- k-means, Density based DB-SCAN, Hierarchical methods- agglomerative and divisive clustering

Unit 14: Introduction to Web Mining
Web Mining introduction, web content mining, web structure mining, web usage mining, text mining, unstructured text, episode rule discovery for text

Unit 15: Introduction to Spatial and Temporal Data Mining
Temporal Data Mining, Temporal Association Rules, Sequence Mining, Spatial Mining, Spatial Mining tasks, spatial clustering

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MCA (S6) 23: Major Project

The guidelines for the project are enclosed in Annexure III.

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ANNEXURE III
PROJECT GUIDELINES

A. PROJECT GUIDE ELIGIBILITY CRITERIA:

Full Time Faculties in the Department of Computer Science/ Information Technology of KKHSOU/ Colleges/ Institutions affiliated to any Indian University recognized by UGC and having minimum 2 years teaching experience.

OR

A person having minimum M. Tech., MCA, M.Sc. in Computer Science/Information Technology from a UGC recognized universities with 4 years experience in Industry/teaching.

B. TYPE OF PROJECT

Learner may choose any topics according to MCA standards. Most of the project work falls under the following types

a. Database oriented (e.g. payroll system, Loan management system etc.)

b. Application oriented (e.g. Mobile apps development, web based development)

c. R & D project (e.g. Image processing, speech processing, data mining, networking etc)

C. PROJECT PROPOSAL (SYNOPSIS)

The project proposal or the synopsis is the frame work for carrying out the project. It should be prepared in consultation with Guide. The necessary parts of a project proposal are given in the following form:

* Title of the Project

* Introduction and Objectives of the Project

* Project Category (RDBMS/ Application/ R & D)

* Tools, Platform, Hardware and Software Requirement specifications

* Whether the project is done for any Industry/Client? The Name and Address of the Industryor Client is to be mentioned

* Methodology

* Expected output

* Conclusion

D. APPLICATION AREAS & RELATED TOOLS

A list of selected area for developing the project work is given below:

APPLICATIONS:

Financial/ Manufacturing/ Multimedia/ Computer Graphics/ Instructional Design/ Database Management System/ Internet/ Intranet/ Computer Networking-Communication Software/E-Commerce/TCP/IP Internals/ Routing protocols/ Implementation of Switches & Routers/ Image processing,/ Mobile apps development/ etc..

Related Tools:

FRONT END / GUI Tools : PhP, Scripting languages etc.

RDBMS/BACK END : Oracle, MYSQL, No SQL, DB2 etc.

LANGUAGES : C, C++, Java, VC++, C#, Matlab, Python, Scilab etc.

INTERNET TECHNOLOGIES : DHTML, Java script, VB Script, HTML, Java, Active X, SWING, JSP,ASP, PHP, XML, Java Beans, Java Servlets, CSS, VB.Net,AWT, J2EE.

NETWORKING TECHNOLOGIES : ATM, Frame Relay, TCP/IP, SNMP, GSM, VoIP, PPP, IP-PSTN, SONET/SDH

WIRELESS TECHNOLOGIES : BlueTooth, 3G, ISDN, EDGE

OPERATING SYSTEMS: WINDOWS/ DOS / UNIX / LINUX /ANDROID.

PROJECT REPORT GUIDELINES:

The Project report should prepared in well structured preferably typed in Latex. Depending on the type of project the report should be as follows

Database project:
Acknowledgement
Content with page number
Declaration Certificate
Certificate from Guide

CHAPTER I: INTRODUCTION

- 1.1 Brief idea about the project
- 1.2 Objective of the project
- 1.3 Scope of the project
- 1.4 Existing system
- 1.5 Proposed System
- 1.6 Platform used(Hardware & Software)
- 1.7 Project location

CHAPTER II: REQUIREMENT ANALYSIS

- 2.1 Introduction
- 2.2 Tools used for Requirement gathering
- 2.3 Problem in Existing System
- 2.4 Conclusion

CHAPTER III: LOGICAL DESIGN

- 3.1 Introduction
- 3.2 DFD (0^{th}, 1^{st}, 2^{nd} level)
- 3.3 ER diagram
- 3.4 Use case diagram
- 3.5 Activity diagram
- 3.6 Conclusion

CHAPTER IV: PHYSICAL DESIGN

- 4.1 Introduction
- 4.2 Database Design (Give your normalized database here)
- 4.3 Module design
- 4.4 Input/output design
- 4.5 Conclusion

CHAPTER V: IMPLEMENTATION

- 5.1 Introduction
- 5.2 Process description (if any)
- 5.3 Output & Report
- 5.4 Conclusion

CHAPTER VI: TESTING

- 6.1 Introduction
- 6.2 Types of testing performed
- 6.3 Conclusion

References
Appendix (if any)

R & D/ Application project:
Acknowledgement
Content with page number
Declaration Certificate
Certificate from Guide

CHAPTER I: INTRODUCTION

1.1 Brief idea about the project
1.2 Objective of the project
1.3 Scope of the project
1.4 Application of the project
1.5 Proposed System
1.6 Platform used(Hardware & Software)
1.7 Project location

CHAPTER II: LITERATURE REVIEW

2.1 Introduction
2.2 Work already done in the area (Historical evidence)
2.3 Problem in Existing technology
2.4 Conclusion

CHAPTER III: THEORITICAL BACKGROUND

3.1 Introduction
3.2 Theory used in the project
3.6 Conclusion

CHAPTER IV: RESULT AND DISCUSSION

4.1 Introduction
4.2 Methodology
4.3 Result
4.4 Analysis on result
4.5 Conclusion

CHAPTER V: Conclusion & Future work

6.1 Introduction
6.2 Chapter wise conclusion
6.3 Future work

References
Appendix (if any)

[Note: All project reports (soft copy) must send to Computer Science Department, KKHSOU in the following email address csc@kkhsou.in]

CERTIFICATE OF ORIGINALITY FROM THE GUIDE

This is to certify that the project report entitled ..... submitted to **Krishna Kanta Handiqui State Open University** in partial fulfilment of the requirement for the award of the degree of **MASTER OF COMPUTER APPLICATION (MCA),** is an original work carried out by Mr./Ms..... Enrolment No.: ..... under the supervision of Dr./Mr./Ms..... The matter embodied in this project is a genuine work done by the student and has not been submitted either to this University or to any other University/Institute for the fulfilment of the requirement of any course of study.

Signature of the Learner

Name
Address
Enrolment No.:

Signature of the Guide

Name
Designation
Address

Study Centre's Seal

FORMAT OF THE PROJECT REPORT

A Project Report on ——————

TITLE OF THE PROJECT ——————

In fulfillment of the requirement for the 6th Semester of
Master of Computer Application
Programme

Font type: Arial
Size: 12, Bold

Font type: Arial
Size: 16, Bold

Submitted by

.....

(Name of the Learner)
Enrollment No.: .....
Session: .....

Font type: Arial

Under the Guidance of

.....

(Name of the Project Guide)

Study Centre

.....

(Name of the Study Centre)

.....

(Location)