

MASTER OF COMPUTER APPLICATIONS (MCA) – SECOND SEMESTER

Second Semester		
Sr. No.	Name of Subject	Credits
1	Data Structure	5
2	Object-Oriented Programming Using C++	5
3	Operating System	5
4	Database Management System	4
5	Minor Project Work	3
Total		22

Subject Name: DATA STRUCTURES

Unit-I

Basic Concepts

1. **Fundamental:** Data Structures, Algorithms and various types of applications.
2. **Basic Data Types:** Stack, Lists and recursion.

Unit-II

Trees & Sets

1. **Trees:** Definition and implementation of binary tree, tree traversal, postfix, prefix notations, heap.
2. **Sets:** Definition and Implementation of hash table, priority queues.

Unit-III

Algorithms & File Structure

1. **Sorting Algorithms :** Quick sort, insertion sort, Bubble sort, merge sort
2. **Searching Algorithms:** Linear search, Binary search, depth first search and Breadth first search techniques.
3. **File Structure:** Sequential, Index Sequential file Structure.

Subject Name: OBJECT ORIENTED PROGRAMMING USING C++

1. OOP paradigm , Advantages of OOP , Comparison between Functional Programming and OOP approach, characteristics of Object oriented Language objects, Class, Inheritance, Polymorphism, and abstraction, encapsulation, Dynamic Binding, Message passing.

2. Introduction to C++, Identifier and keywords, constants, C++ Operators, Type Conversion, variable declaration, Statement, expressions, User defined data types, Conditional expression (For, While, Do-while) loop statement , breaking control statement (Break, Continue).
3. Defining a function, type of functions, Inline functions, Call by value and Call by reference, Preprocessor, Header files and standard functions, Structures, Pointers and structures, Unions, Enumeration. **Classes**, Member functions, Objects, Array of objects, Nested classes, Constructors, Copy Constructors, Destructors, Inline member functions, Static class member, friend functions, Dynamic memory allocation.
4. Inheritance: Single inheritance, Multi-level inheritance, hierarchical, Virtual base class, Abstracts classes, Constructors in Derived classes, nesting of classes.
5. Function overloading , Operator overloading, polymorphism, Early binding, Polymorphism with pointers, Virtual functions, Late binding , Pure virtual functions, Opening and closing of files, Stream member function , Binary file operations, Structure and file operations, classes and file operations, Random access file processing.

Subject Name: - OPERATING SYSTEMS

1. **Operating System Overview:** Introduction, Objectives and functions, Basic Elements, Evolution of Operating System, Instruction Execution, Interrupts, Memory, Memory Hierarchy, System Components, Operating system Services, System Calls, Virtual Machines, System Design and Implementation.
2. **Process Concepts:** Introduction, Process States, Process Control Block (PCB), Process Scheduling, Co-operating Processes, Threads, Inter Process Communications (IPC).
3. **CPU Scheduling:** Scheduling Criteria, Types of Scheduling, Scheduling Algorithms, Multiple-processor Scheduling, Real-time Scheduling, Disk-Scheduling Policies.
4. **Memory Management:** Introduction, Memory –management Requirements, Logical and Physical Address Space, Swapping, Loading Programs into main memory, Paging, Page Replacement Algorithms, Allocation Of Frames, Translation Look Aside Buffer (TLB), Simple Segmentation with Paging, page Size, Thrashing.
5. **File System:** Introduction, File Organization and Access Methods, Directory Structure, Protection, Security Threats, Intruders, Viruses, File-System Structure, File Allocation Methods, Free-Space Management, Directory Management, Efficiency and Performance of Secondary Storage.
6. **Deadlocks:** Introduction, Principles, Principles Of Deadlocks, System Model, Deadlock Characterization, Resource- allocation Graphs, Methods For Handling Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection on, Recovery from Deadlock.
7. **Process Management and Synchronization:** Introduction, Critical Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors, Message Passing.

Subject Name: DATABASE MANAGEMENT SYSTEM

1. **Basic - Concepts of Database Systems:** Database Schema, Instance and Database state, The Three-Schema Architecture, Data Independence, DBMS Languages, People Deal with Databases.
2. **Entry - Relationship Model:** The E- R Model, Entity Relationship Diagram, Composite versus Atomic Attributes, Role Names Recursive Relationships, Constraints on Relationship Types.
3. **Data Models and Its Implementation:** The Hierarchical Data Model, the Network Data Model, Network Modeling Concepts, the Relational Model.

4. **Introduction to Relational Model:** CODD'S 12 Rules for a fully relational DBMS, Basic Concepts of Relational Model, Referential Integrity Constraints, Enforcing Integrity Constraints.
5. **Oracle: A Relational Database Management System** Oracle System Structure,. Oracle Server, Oracle Database Structure, Oracle Schema Objects, Oracle Data Dictionary.
6. **Structured Query Language: SQL:** Three Parts of SQL, Sub-Queries, Referential Integrity, Some Other SQL Command.
7. **Procedural Language/ Structured Query Language:** PL/SQL Runtime Architecture (PL/SQL Engine), Procedure, Parameters, Packages, Cursors, Triggers.
8. **Relational Algebra and Relational Calculus:** Relational- Oriented Operation, Set-Oriented Operations and Union Compatibility, Aggregate Function and Grouping, Tuple Relation Calculus.
9. **Normalizing Database:** Benefits of Normalization, Function Dependency, The Domain Key Normal Form.
10. **Database Design and Tuning:** The Database Design Process, Requirements and Analysis, Choice of DBMS, Logical Database Design, Database Implementation and Tuning.
11. **Transaction Processing:** Concurrency Control, Recoverability.
12. **Query Processing and Query Optimization:** Query Processing, Query Optimization, Heuristics Rules in Query Optimization, Information used in Cost Function.
13. **Database Recovery Techniques:** Classification of Transaction Failures, Recovery Techniques Base on Deferred Update, Recovery Techniques Base on Immediate Update, Buffer Management.
14. **Concurrency Control Techniques:** The Acid Test for Transaction Management, Binary Locks, Serializability by Two-Phase Locking, Deadlock Problem.
15. **Data Warehousing:** Data Warehouse Definition, Data Form Legacy Systems, Decision- Support and Executive Information Systems.
16. **Data Mining and Web Mining:** Data Mining Techniques, Future Direction of Data Mining, Data Mining Techniques for Web Searching.
17. **Object- Oriented Database:** History Of OODBMS, Need for Abstract Data Types, O-O Features in SQL3, Hypertext Databases.
18. **Distributed Database:** Structure of Distributed Database, Design of Distributed Database, Advantage of Distributed Database, DDBMS Prototypes.