Unit -1
Introduction to Data Structures : About Data Structures – Information and Meaning, binary and decimal integer, Concept of Data Types, Data Structure, Data Representation and Implementation, ADTs, Sequence of value definitions, ADT for varying length data string. Arrays, records and Pointers- About arrays, Records and Pointers; their implementation in memory. Arrays as an ADT, Using one dimensional and 2D, about record and pointers. Linked List- Concept of single linked list, operations on linked list, inserting and removing nodes from a list, Array implementation of lists, Limitations of the array implementation over linked list, Concept of double linked list, generalized list.

Unit -2
Stacks and Queues- Stacks – Definition and examples, primitive operations, stack as an ADT, Implementation of stacks as an array and linked list, Operations on stacks, stacks stored as an linked list, Arithmetic expressions – Infix, postfix, Prefix, Evaluating Postfix expressions, Converting an expression from infix to postfix. Queues – Definition and examples of queues, queues as an ADT, queues stored as a linked list. Circular queue, implementation of queues as an array and linked list, operations on queues, priority queue and Dequeue.

Unit -3
Recursion – Recursive Definition and process, factorial function, multiplication of natural numbers, Fibonacci sequence, Properties of recursive definitions, Writing recursive programs (Tower of Hanoi, Converting prefix to Postfix using recursion), Simulating recursion return from a function, implementing recursive function, simulation of factorial.)

Unit -4
Trees and Graphs: Trees – Definition of trees, Basic terminology of trees, Binary tree, Binary tree representation as an array and Linked list, application of trees, binary tree traversal, threaded binary tree, height balance tree, B-trees, General trees. Graphs - Basic terminology of graphs, implementation of graphs as an array and linked list, operations on graphs, graph traversals.

Unit -5
Sorting and Searching : Sorting- Definition of sorting, Classification of sorting techniques, different sorting techniques – Bubble Sort, Quick Sort. Efficiency of Quick sort, Insertion Sort, Merge Sort, and Heap Sort. Searching.- Basic search techniques, (Dictionary as an ADT , Sequential Searching, Efficiency of sequential searching), Searching as an ordered table, Binary Search.

Books
1) Data Structures using C and C++ By Tannenbaum 2nd Edition PHI New Delhi
2) Classical Data Structures By D. Samanta PHI Publication New Delhi
MCA, Semester- II

2CSA-2: Database Management System

Unit -1

Unit -2
Data Models – Introduction, Data Association(Entities, Attributes, and Association, Relationship among entities, representation of association and relationships), Data Model Classification –( Approaches to the relational model, Hierarchical model, and Network Model with an example). Entity – Relationship model, Concepts of file organization – Sequential Files, index Sequential Files, Direct Files, Secondary Key retrieval.
Unit -3
The Relational Model – Introduction, Relational Database: Attributes and domains, tuples, Relations and their schemas, relational representation, Keys, relationship, relational operations, Integrity rules. Relational Algebra – Basic operations, Relational Algebra queries, Relational Calculus: tuple calculus, domain Calculus. Relational Database Manipulations: Introduction, SQL, Data Manipulation in SQL, Quel, Data Manipulations in Quel, QBE, Data Manipulations in QBE.

Unit -4
Relational Database Design – Relational Schema, Relational Design, functional dependencies, Normalizations, 1NF, 2NF, 3NF, Relations with more than one candidate key. Good and Bad decomposition, Multi Valued dependencies, 4NF, 5NF. Network Data Model: Architecture of DBTG systems, Schema and subschema, and DBTG data manipulation facility. Hierarchical Data Model: The tree concept, architecture of an IMS system, Data Manipulation.

Unit - 5

Books:
1) Database Management Systems By Panneerselvam [PHI]
2) An Introduction to Database systems By Bipin C. Desai [Galgotia].
3) An Introduction to Database Systems By C.J. Date [Narosa].

MCA, Semester- II
2CSA-3: Discrete Mathematics and Graph Theory

Unit -1
Fundamental – Sets and Relations, Operations on sets, Sequences, Division in the integers, Matrices, Mathematical Structures. Logic- Proposition and logical operations, conditional statements, Methods of proof, mathematical Induction.

Unit-2
Mathematical Logic- Statements and Notation, Connectives, Normal Forms, The Theory Or Interface For The Statement Calculus, Interface Theory Of The Predicate Calculus.

Unit-3
Counting – Permutations, Combinations, The Pigeonhole Principle, Recureernee Relations, Relations And Digraphs-Product Sets And Partitions, Relation & Digraphs,

Unit – 4
Graph Theory – Basic Concept of Graph Theory, Euler's Path & Circuits, Hamiltonian Path & Circuits, Other Relations & Structure– Partially Ordered Sets Lattices, Finite Boolean Functions As Boolean Polynomials. Trees – Introduction, Undirected Trees, Minimal Spanning Trees.

Unit- 5
Semigroups & Groups– Binary Operations Revisited, Semigroups, Group Products & Quotients Of Groups, Introduction To Computability Theory–Languages, Finite State Machines, Semigroups, Machines & Languages

Books
1. Discrete Mathematical Structures By Bernard Kolman, Robert C. Busby & Sharon Ross.[PHI]
4. Discrete Mathematics With Graph Theory By E. Goodaire,[PHI].
5. Discrete Mathematics By J.K. Sharma (McMillan)
6. A First Course In Graph Theory By Choudham (McMillan)

MCA, SEMESTER-II
2CSA-4: Java Programming

Unit –1:

Unit-2
Creating A New Object, Accessing & Saving A Class & Instance Variable, Calling Methods, References To Objects, Campaigning Objects, Determining The Class Of An Object In Java Class Library, Arrays, Conditional Loops, How Applets 7 Applications Are Different In Creating Applets. Passing Parameters To Applets

Unit-3
Filling, Text & Fonts, Creating Font Objects, Using Color Objects, Creating Animation in Java, Threads: What Are They? The Need, Writing With Threads.

Unit – 4:
Networking in java, Windows0, Menus & Dialog Boxes, Creating Links inside Applets, Opening Web Connection, the URL Connection Class, Sockets, Package, Programming in Large, Programming in Small, Heading Class, Interfaces.

Unit – 5:
Exception, Creating and Using Threads, The runnable Interface, Thread Tester, Named Thread Tester, Thread Scheduling, Input Stream, Output Stream.

Books:
1. Java – Complete References.
4. An Introduction to Object Oriented Programming with Java – Thomas Wu, TMH.

MCA, Semester- II
2CSA-5: Statistics and Numerical Mathematics

Unit-1


Unit – 2

Measures of Dispersion, Skewness and Kurtosis – Meaning and Significance of Dispersion, Methods of Measuring Dispersion- Range, Quartile, Mean Deviation, Standard Deviation, Coefficient of Skewness, Kurtosis, Coefficient of Dispersion, Coefficient of Variation. Correlation and Regression – Definition of Correlation, Scatter Diagram, Karl Person Coefficient of Correlation, Limits for Correlation Coefficient, Definition of Regression, Lines of Regression, Regression curves, Regression Coefficient, properties of Regression Coefficients, Correlation Analysis vs. Regression Analysis.

Unit – 3

**Unit – 4**


**Unit – 5**


**Books**

1. Fundamental of Mathematical Statistics By Gupta & Kapoor [Sultan Chand & Sons].
3. Statistics for Management By Levin [PHI].