

Batch 2024-25

Syllabus

2nd Semester

Bachelor of Computer Applications

B.C.A.

BCA

SEMESTER 2

240/BCA/CC201

Course code	CC-ID4			
Category	Core Subject			
Course title	Data Structure			
Course ID	240/BCA/CC201			
Scheme and Credits	L	T	P	Credits
	3	0	2	4
Theory Internal	25			
Theory External	50			
Practical Internal	05			
Practical External	20			
Total	100			
Duration of Exam	3 Hrs			

Note: The examiner will set nine questions in total. Question one will have seven parts from all units and the marks of first question will be of 20% of total marks of Question Paper and the remaining eight questions to be set by taking two questions from each attempt FIVE questions in all, selecting one question from every unit apart from the Question Number 1.

Course Outcomes:

CO1: Choose appropriate data structures and algorithms and use it to design solution for a specific problem.

CO2: Execute the operations of hashing to retrieve data from data structure.

CO3: Comprehend and select algorithm design approaches in a problem specific manner.

CO4: Design and analyze programming problem statements.

UNIT – I

Data Structure Definition, Data Type vs. Data Structure, Categories of Data Structures, Data Structure Operations, Applications of Data Structures, Algorithms Complexity and Time-Space Trade-off, Big-O Notation. Strings: Introduction, Strings, String Operations, Pattern Matching Algorithms.

UNIT – II

Arrays: Introduction, Linear Arrays, Representation of Linear Array in Memory, Traversal, Insertions, Deletion in an Array, Multidimensional Arrays, Sparse Matrix. Algorithm for Insertion, Deletion Addition and Multiplication in 2- D Array. Searching and Sorting Techniques, Sorting Techniques: Bubble Sort, Merge Sort, Selection Sort, Heap Sort, Insertion Sort. Searching Techniques: Sequential Searching, Binary Searching, Search Trees.

UNIT – III

Stacks & Queues: Representation of Stacks, Stack Operations, Applications, Queues, Operations on Queues, Circular Queues, Dequeue, Priority Queues, Applications. Linked Lists: Introduction, Types, Operations (Insertion, Deletion, Traversal, Searching, Sorting), Applications, Dynamic Memory Management, Implementation of Linked Representations.

UNIT – IV

Trees: Basic Terminology, Representation, Binary Trees, Tree Representations using Linked List, Basic Operation on Binary tree, Traversal of Binary Trees: In order, Pre-order & Post-order, Applications of Binary tree. Graphs: Definitions and Basic Terminologies, Representation of Graphs, Graph Traversals, Shortest Path Algorithm.

Textbooks & Reference Books:

1. Seymour Lipschutz, Data Structures, Tata McGraw-Hill Publishing Company Limited, Schaum's Outlines.
2. Yedidyan Langsam, Moshe J. Augenstein, and Aaron M. Tenenbaum, Data Structures Using C, Pearson Education.
3. Trembley, J.P. And Sorenson P.G., An Introduction to Data Structures With Applications, McGraw-Hill.
4. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, Addison-Wesley.

Data Structure Lab

List of Experiments

1. Write a program to search an element in a two-dimensional array using linear search.
2. Using iteration & recursion concepts write programs for finding the element in the array using Binary Search Method
3. Write a program to perform following operations on matrix (a) Addition (b) Subtraction (c) Multiplication (d) Transpose
4. Using iteration & recursion, write the programs for Quick Sort
5. Write a program to implement selection sort
6. Write a program to implement insertion sort
7. Write a program to implement bubble sort
8. Write a program to implement the various operations on string such as length of string concatenation, reverse of a string & copy of a string to another.
9. Write a program to implement stack operations.



10. Write a program to implement queue operations.
11. Write a program to create a linked list & perform operations such as insert, delete, update, reverse in the linked list

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240/BCA/CC202

Course code	CC-ID5			
Category	Core Subject			
Course title	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE			
Course ID	240/BCA/CC202			
Scheme and Credits	L	T	P	Credits
	3	1	0	4
Theory Internal	30			
Theory External	70			
Total	100			
Duration of Exam	3 Hrs			

Note: The examiner will set nine questions in total. Question one will have seven parts from all units and the marks of first question will be of 20% of total marks of Question Paper and the remaining eight questions to be set by taking two questions from each attempt FIVE questions in all, selecting one question from every unit apart from the Question Number 1.

Course Outcomes:

CO1: Gain proficiency in measures of central tendency and dispersion, correlation, and regression analysis, enabling effective data analysis and interpretation.

CO2: Understand fundamental algorithms such as exponentiation, linear search, and binary search, and grasp concepts in graph theory including types of graphs, adjacency matrices, and Eulerian and Hamiltonian paths.

CO3: Master concepts related to trees including minimum distance and spanning trees, and algorithms like merge sort, insertion sort, and bubble sort, enhancing problem-solving skills in algorithmic design.

CO3: Develop proficiency in solving recurrence relations and understanding their applications, and grasp foundational concepts in number theory including mathematical induction, GCD, Euclidean algorithm, and public key encryption schemes.

UNIT-I

Basic Statistics: Measure of Central Tendency, Preparing frequency distribution table, Mean, Mode, Median, Measure of Dispersion: Range, Variance and Standard Deviations, Correlation and Regression.

UNIT-II

Algorithm: Algorithms, merits and demerits, Exponentiation, How to compute fast exponentiation. Linear Search, Binary Search, "Big Oh" notation, Worst case, Advantage of logarithmic algorithms over linear

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algorithms, complexity.

Graph Theory: Graphs, Types of graphs, degree of vertex, sub graph, isomorphic and homeomorphic graphs, Adjacent and incidence matrices, Path Circuit ; Eulerian, Hamiltonian path circuit.

UNIT-III

Tree: Trees, Minimum distance trees, Minimum weight and Minimum distance spanningtrees.

Recursion: Recursively defined function.

Merge sort, Insertion sort, Bubble sort, and Decimal to Binary.

UNIT-IV

Recurrence Relations: LHRR, LHRRWCCs, DCRR. Recursive procedures.

Number Theory: Principle of Mathematical induction, GCD, Euclidean algorithm, Fibonacci numbers, congruences and equivalence relations, public key encryption schemes.

Textbooks & Reference Books:

1. Gupta S.P. and Kapoor, V.K., Fundamentals of Applied statistics, Sultan Chand & Sons, 1996.
2. Gupta S.P. and Kapoor, V.K., Fundamentals of Mathematical statistics, Sultan Chand and Sons, 1995.
3. Graybill, Introduction to Statistics, McGraw.
4. Anderson, Statistical Modelling, McGraw.
5. Babu Ram : Discrete Mathematics



240/BCA/CC203

Course code	CC-ID6			
Category	Core Subject			
Course title	Database Management System			
Course ID	240/BCA/CC203			
Scheme and Credits	L	T	P	Credits
	3	0	2	4
Theory Internal	25			
Theory External	50			
Practical Internal	05			
Practical External	20			
Total	100			
Duration of Exam	3 Hrs			

Note: The examiner will set nine questions in total. Question one will have seven parts from all units and the marks of first question will be of 20% of total marks of Question Paper and the remaining eight questions to be set by taking two questions from each attempt FIVE questions in all, selecting one question from every unit apart from the Question Number 1.

Course Outcomes:

CO1: Express the basic concepts of DBMS and RDBMS.

CO2: Apply normalization theory to the normalization of a database

CO3: Apply the concept of Transaction Management & Recovery techniques in RDBMS.

CO4: Analyze various concurrency control and recovery techniques.

UNIT-I

Database System Concepts and Architecture: Traditional File Processing System vs DBMS, Characteristics & Advantages of DBMS, Three-Schema Architecture and Data Independence; Data Models, Schemas, and Instances; Database Languages and Interfaces; Classification of DBMS.

Data Modeling: Overview of Entity-Relationship Diagram, Relational Model -Constraints, Relational Database Schemas, Relational Algebra and Relational Calculus; Codd Rules.

UNIT-II

Normalization for Relational Databases: Functional Dependencies and Normalization; **SQL:** SQL as 4GL, SQL Components: DDL, DML, DQL, DCL, TCL; Data Definition and Data Types; Constraints, Queries, Insert, Delete, and Update Statements; Views, Stored Procedures and Functions; Database Triggers, SQL Injection.

UNIT-III

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Query Processing and Optimization: Translating SQL queries into Relational Algebra, Basic Algorithm for Executing Query Operations, Using Heuristic in Query Optimization, Using Selectivity and Cost Estimation in Query Optimization, Semantic Query Optimization.

Transaction Processing: Introduction, Desirable properties of Transactions, Schedules & Recoverability, Serialization of Schedulers, Transaction Support in SQL.

UNIT-IV

Concurrency Control Techniques: Locking techniques for Concurrency Control, Concurrency Control based on Timestamp ordering, Multiversion Concurrency Control Techniques, Validation Currency Control Techniques, Granularity of data items and multiple granularity locking, Using locks for Concurrency Control in Indexes.

Database Recovery Techniques: Basic Concepts.

Basics of Database Security and Authorization.

Textbooks & Reference Books:

1. Elmasri & Navathe: Fundamentals of Database Systems, 5th edition, Pearson Education.
2. C.J.Date: An Introduction to Database Systems, 8th edition, Addison Wesley N. Delhi.
3. Thomas Connolly, Carolyn Begg: Database Systems, Pearson Education.

Data Base Management System Lab

List of Experiments

1. Creation of a database and writing SQL queries to retrieve information from the database.
2. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
3. Creation of Views, synonyms, Sequences, indexes, and save points.
4. Creating an employee database to set various constraints.
5. Mini project (Any 2 Application Development using MySQL)
 - a. Inventory Control System



- b. Material Requirement Processing.
- c. Hospital Management System.
- d. Railway Reservation System.
- e. Personal Information System.
- f. Web-Based User Identification System.
- g. Time Table Management System.
- h. Hotel Management

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