

**JYOTI NIVAS COLLEGE AUTONOMOUS
SYLLABUS FOR 2021 BATCH AND THEREAFTER
PROGRAMME: B.SC.
SEMESTER: II - DATA STRUCTURES**

COURSE CODE: 21HCS2

NO. OF HOURS: 60

Course Objective:

- Define and understand concepts of complexity in terms of time, space and the various notations involved.
- Describe the problem and the data involved and to appropriately select the right data structure.
- Demonstrate the operations like searching, sorting insertion, and deletion, traversing mechanism etc. on various data structures.
- Solve the concepts of arrays and linked lists and summarise the complex data structures like stacks, queues, trees, graphs, heaps etc.

Learning Outcome :

- Examine the concepts of complexity in terms of time, space and the various notations involved.
- Explain the problem and the data involved and to appropriately select the right data structure.
- Evaluate the operations like searching, sorting insertion, and deletion, traversing mechanism etc. on various data structures.
- Formulate the concepts of arrays and linked lists and creating complex data structures like stacks, queues, trees, graphs, heaps etc.

UNIT-I

15

Hours

Introduction and Overview: Definition, Elementary data organization, Classification of Data Structures, data Structures operations, Abstract data types. Mathematical notations and functions, Algorithmic Notations, control structures, Complexity of algorithms, asymptotic notations.

Arrays: Definition, Linear arrays, arrays as ADT, Representation of Linear Arrays in Memory, Traversing Linear arrays, Inserting and deleting, Multi-dimensional arrays, Matrices and Sparse matrices.

String Processing: Definition, Storing Strings, String as ADT, String operations, word/text processing, Pattern Matching algorithms.

Unit II

15 hours

Searching: Introduction, Sequential Search, Binary Search, Comparison of Methods.

Sorting: Introduction, Insertion Sort, Selection Sort, Shell Sort, Divide and Conquer- Merge sort, Quick sort.

Unit-III

15

Hours

Linked list: Definition, Representation of Singly Linked List in memory, traversing a Singly linked list, searching in a Singly linked list, Memory allocation, Garbage collection, Insertion into a singly linked list- insert beginning, end, given position, Deletion from a singly linked list; Doubly linked list, Header linked list, Circular linked list.

Stacks: Definition, Array representation of stacks, linked representation of stacks, Arithmetic Expressions: Polish Notation, Conversion of infix expression to postfix expression, Evaluation of Post fix expression, Application of Stacks, Recursion, Towers of Hanoi.

Queues: Definition, Array representation of queue, Linked list representation of queues. Types of queue: Simple queue, Circular queue, Double-ended queue, Priority queue, Operations on Queues, Applications of queues.

Unit-IV

15

Hours

Binary Trees: Definitions, Tree Search, Traversal of Binary, Building a Binary Search Tree, Heaps, Applications of Trees.

Graphs: Mathematical Back ground, Computer Representation, Graph Traversal, Topological Sorting.

Hashing: Choosing a Hash function, Collision Resolution with Open Addressing, Collision Resolution by Chaining.

Text Books:

1. Seymour Lipschutz, "Data Structures with C", Schaum's outLines, Tata Mc Graw Hill, 2011.
2. Robert Kruse, C.L.Tondo, Bruce Leung, Shashi Mogalla, "Data Structures and Program Design using C", Pearson Education, 2009.

Reference Books:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 2013
2. Forouzan, "A Structured Programming Approach using C", 2nd Edition, Cengage Learning India, 2008.

DATA STRUCTURES LAB

Course outcomes:

- Practical explanation on the appropriate data structure and algorithm design method for a given application.
- Understand the different operations acting on data structures such as arrays, stacks, queues, linked lists and binary search trees with the help of appropriate programs.
- Illustration on implementing of different techniques related to sorting, searching.
- Define the data structures and to manipulate data within it using operations like insertion, deletion and traversal

Learning Outcome :

- Create their own implementation on different data structure on the various methods.
- The ability to visualize the problem and the data involved and to appropriately select the right data structure.
- Construct the data structure to perform the operations like searching, sorting insertion, and deletion, traversing mechanism etc. on various data structures.
- Develop programs on arrays and linked lists and invent the complex data structures like stacks, queues, trees, graphs, heaps etc

NOTE: For all the programs write the output, flowchart and number of basic operations performed.

1. Write a program to insert and delete an element into an array {2,34,56,7,8,9,22}.
2. Given {4,7,3,2,1,7,9,0} find the location of 7 using Linear and Binary search and also display its first occurrence.
3. Given {5,3,1,6,0,2,4} order the numbers in ascending order using Bubble Sort Algorithm
4. Perform the Insertion and Selection Sort on the input {75,8,1,16,48,3,7,0} and display the output in descending order.
5. Perform the divide and conquer technique for quick sort on the input {70,80,10,6,8,38,0,2} and display the output in ascending order.
6. Given S1={"Flowers"} ; S2={"are beautiful"} I. Find the length of S1 II. Concatenate S1 and S2 III.Extract the substring "low" from S1 IV. Find "are" in S2 and replace it with "is"
7. Write a program to insert the elements {61,16,8,27} into singly linked list and delete 8,61,27 from the list. Display your list after each insertion and deletion.

8. Write a program to insert the elements {61,16,8,27} into linear queue and delete three elements from the list. Display your list after each insertion and deletion.
9. Write a program to insert the elements {61,16,8,27} into ordered singly linked list and delete 8,61,27 from the list. Display your list after each insertion and deletion.
10. Write a program to add $6x^3+10x^2+0x+5$ and $4x^2+2x+1$ using linked list.
11. Write a program to push 5,9,34,17,32 into stack and pop 3 times from the stack, also display the popped numbers.
12. Write a recursive program perform Tower of Hanoi.
13. Write a program to insert the elements {5,7,0,6,3,9} into circular queue and delete 6,9&5 from it (using linked list implementation).
14. Write a program to convert an infix expression $x^y/(5*z) + 2$ to its postfix expression
15. Write a program to evaluate a postfix expression $5\ 3+8\ 2 - *$.
16. Write a program to create a binary tree with the elements {18,15,40,50,30,17,41} after creation insert 45 and 19 into tree and delete 15,17 and 41 from tree. Display the tree on each insertion and deletion operation
17. Write a program to create binary search tree with the elements {2,5,1,3,9,0,6} and perform inorder, preorder and post order traversal.