

FACULTY OF COMPUTER APPLICATIONS
Bachelor of Science (Information Technology)
B.Sc. (IT)

- **Sem.** : 3
- **Subject Code** : 05BS0303
- **Subject** : Data Structure
- **Course Objectives** :
 1. To understand concept of algorithm analysis and data structure.
 2. To understand stack and queue with its applications.
 3. To understand linked list with its applications.
 4. To work with Tree and Graph.
 5. To compare different searching and sorting techniques.
- **Prerequisite:** Knowledge of C programming language

Unit No	Topics Covered	No of lectures required
1	Introduction to Data Structures and Algorithms : Basic Terminology, Classifications of Data Structure, Operations on Data Structures, Operations on Data Structures, Abstract Data Type, Algorithms, Different Approaches to Designing an Algorithm, Control Structures Used in Algorithms, Time and Space Complexity, Asymptotic Notations (Big O, Small O, Theta, Omega and Small Omega)	10
2	Stack : Introduction to Stacks, Array Representation of Stacks, Operations on a Stack, Linked Representation of Stacks, Operations on a Linked Stack, Stack Applications – infix to postfix conversion, recursion Queue : Introduction to Queues, Array Representation of Queues, Linked Representation of Queues, Types of Queues	10
3	Linked Lists : Introduction, Array v/s Linked List, Types of Linked List – Singly Linked List, Doubly Linked List, Circular Singly Linked List and Circular Doubly Linked List, Stack using	12

FACULTY OF COMPUTER APPLICATIONS
Bachelor of Science (Information Technology)
B.Sc. (IT)

	<p>Linked List, Queue using Linked List, Operations on Linked List - (For all the types of Linked list)</p> <p>1] Create 2] Display 3] Insert o insert first o insert last o insert before desired o insert after desired 4] Delete o delete first o delete last o delete before desired o delete after desired 5] Search particular element 6] Sort list in ascending order 7] Update an element. 8] Count no. of nodes</p>	
4	<p>Tree : Introduction, Types of Trees, Creating a Binary Tree from a General Tree, Traversing a Binary Tree</p> <p>Graph : Introduction , Graph Terminology, Directed Graphs, Bi-connected Components, Representation of Graph, Graph Traversal Algorithms</p>	10
5	<p>Searching : Introduction to Searching, Linear Search, Binary Search</p> <p>Sorting : Introduction, Sorting Techniques – Bubble sort, Insertion sort, Selection sort</p>	08

Course Outcomes : (Students will able to)

1. Define the concept of data structure and categories of data structure.
2. Describe analysis of algorithm.
3. Demonstrate the concept and application of linear data structures like stack, queue and linked list.
4. Construct different types of trees and graphs.

FACULTY OF COMPUTER APPLICATIONS
Bachelor of Science (Information Technology)
B.Sc. (IT)

- Compare and contrast different searching and sorting techniques and find out better technique by calculating time and space complexity.

Course Outcomes – Program Outcomes Mapping Table :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	H	H	L			M	H	L
CO2	M	H	M				H	L
CO3	L	H	M				H	L
CO4	L	H	M				H	L
CO5	L	H	M				H	L

Main Reference :

- Data Structures Using C, Reema Thareja, Oxford, Second Edition.

Other References :

- An Introduction to Data Structures with Applications, Tremblay Tata McGraw-Hill Education, Second edition.
- Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, The MIT Press, 3rd Edition
- Data Structures Using C++, Varsha H. Patil, Oxford, First Edition.
- Data Structures using C, ISRD Group, ACE Series, Tata McGraw Hill Publication, First Edition.

Web References :

- <https://www.programiz.com/dsa>
- <https://www.geeksforgeeks.org/data-structures/>

App References :

- AlgoPrep - Algorithms & Data structures Made Easy Pranit Krishna Kulkarni Education
- Data Structures Handbook, Bash Overflow Education

Syllabus Coverage from text /reference book & web/app reference:

Unit #	Chapter Numbers
1	2

FACULTY OF COMPUTER APPLICATIONS
Bachelor of Science (Information Technology)
B.Sc. (IT)

2	7.1 to 7.5, 7.7.3, 7.7.4, 8.1 to 8.4
3	6.1 to 6.5
4	9.1 to 9.4, 13.1 to 13.6
5	14.1 to 14.3, 14.6 to 14.9

PRACTICALS

Note : Practical using C programming language

Unit No	List of Practicals
2	<p align="center">***** Stack *****</p> <p>1] Write a program which performs following stack operations. ->push() -> pop() -> peep() -> update() 2] Write a program to find out factorial of number using stack. 3] Write a program to print string in reverse order using stack. 4] Write a tower of Hanoi program. 5] Write a program of dynamic stack.</p> <p align="center">***** QUEUE *****</p> <p>1] Write a program which performs following operations using simple queue. <input type="checkbox"/> <input type="checkbox"/> insert()-> delete() -> display() 2] Write a program which performs following operations using circular queue. <input type="checkbox"/> <input type="checkbox"/> Insert()-> delete() -> display() 3] Write a program of dynamic queue.</p>
3	<p align="center">***** LINKED LIST *****</p> <p>Perform following operations :</p> <p>1] Create 2] Display 3] Insert <input type="radio"/> insert first <input type="radio"/> insert last <input type="radio"/> insert desired <input type="radio"/> insert before desired <input type="radio"/> insert after desired</p>

FACULTY OF COMPUTER APPLICATIONS
Bachelor of Science (Information Technology)
B.Sc. (IT)

	<p>4] Delete</p> <ul style="list-style-type: none"> ○ delete first ○ delete last ○ delete desired ○ delete before desired ○ delete after desired <p>5] Search particular element 6] Sort list in ascending order 7] Update an element. 8] Count no. of nodes</p> <p>⇒ Write a program to perform above operations using singly linked list ⇒ Write a program to perform above operations using doubly linked list ⇒ Write a program to perform above operations using circular singly linked list ⇒ Write a program to perform above operations using circular doubly linked list</p>
4	<p align="center">*****TREE AND GRAPH*****</p> <p>1] Write a program to create a binary tree . Traverse tree in preorder , postorder and inorder. 2] Write a program to represent graph using linked list and implement for DFS and BFS algorithm for traversing.</p>
5	<p align="center">*****SORTING AND SEARCHING *****</p> <p>1] Enter N elements and arrange the elements using :</p> <ul style="list-style-type: none"> <input type="checkbox"/> Selection sort <input type="checkbox"/> Bubble sort <input type="checkbox"/> Insertion sort <p>2] Enter N elements and perform search operations using :</p> <ul style="list-style-type: none"> <input type="checkbox"/> Linear search <input type="checkbox"/> Binary search (with recursion, without recursion)