



B. Tech in COMPUTER SCIENCE AND ENGINEERING

B.Tech. II Year II Semester Course Syllabus (KR23)

DATA STRUCTURES (23CC402PC)

Common for CSE, CSE (DATA SCIENCE), CSE (AI&ML), IT

L	T	P	C
3	0	0	3

Prerequisite/Corequisite: NIL

Course Objectives: The course will help to

1. Learn the syntax and semantics of the C++ programming language.
2. Implement ADTs such as lists, stacks, queues, trees, graphs, search trees in C++ to solve problems.
3. Choose an appropriate data structure for a specified application.
4. Understand the behaviour of data structures such as trees, hash tables, search trees, Graphs and their representations.
5. Understand and analyze various searching and sorting algorithms.

Course Outcomes: The student will be able to

1. Understand C++ Program structure, functions, and templates.
2. Differentiate types of recursions, array and dynamic array and linear and non-linear data structures.
3. Construct programs using a variety of data structures such as stacks, queues, hash tables, binary trees, search trees, heaps, graphs.
4. Interpret appropriate data structures to represent data items in real world problems.
5. Design and implement sorting and searching algorithms, their implementation, efficiency, and practical application. They will be equipped to choose the most suitable algorithm for specific tasks and analyze the performance.

UNIT – I:

Basic Concepts of C++ - Structure of a C++ program, Data types, Declaration of variables, Expressions, Operators, Operator Precedence, Evaluation of expressions, Type conversions.

Flow control statement- if, switch, while, for, do, break, continue, goto statements. Functions - Scope of variables, Parameter passing, Default arguments.

Templates - Types of templates, Class - definition, structure, objects, access modifiers, scope, this pointer, Constructors and Destructors, inheritance, virtual functions.

UNIT – II:

Recursion, Arrays: Recursion, Direct Recursion, Indirect Recursion, Data Abstraction, Representation of single, two-dimensional arrays, row order majoring, column order majoring, Dynamic Array- polynomials, sparse matrices-array and linked representations, Dynamic Array vs Array.

Introduction to Linear data structures-Linear list ADT-array representation and linked representation, Types of Linked List - Singly Linked Lists-Operations-Insertion, Deletion, Doubly Linked Lists- Operations-Insertion, Deletion, Real Time Applications of Linked List.

UNIT- III:

Stacks: Definition, ADT, standard stack operations- array and linked list implementations, applications-infix to postfix conversion, postfix expression evaluation, parsing parentheses, reverse of a string using stack.

Queues: Definition, ADT, standard queue operations - array and linked implementations, Circular queues - Insertion and deletion operations.

UNIT IV:

Non-Linear Data Structures: Trees – Definition, terminology, Binary trees-definition, Properties of Binary Trees, Binary Tree ADT, representation of Binary Trees - array and linked representations, Binary Tree traversals- DFS-In-order, Post-order, Preorder, BFS – Level order traversal, Binary Search Tree ADT – BST traversal

UNIT V:

Graphs–Definitions, Terminology, Applications and more definitions, Properties, Graph ADT, Graph Representations- Adjacency matrix, Adjacency lists, Graph Search methods - DFS and BFS.

Sorting- Merge Sort, Heap sort, **Priority Queues**–Definition and applications, Max Heap, Min Heap.

Hashing-Definition, hash tables, hash functions, Collision resolution techniques - linear probing, chaining.

TEXTBOOKS:

1. Data Structures Through C++ - Yashavant Kanetkar, 4th Edition, BPB Publications, 2022.
2. Data structures using C++- D. S. Malik, 2nd Edition, Cengage learning, 2009.
3. The Complete Reference C++- Herbert Schildt, 4th Edition, Tata Mc Graw Hill, 2017.

REFERENCE BOOKS:

1. Data Structures and Algorithm Analysis in C++, 4th Edition, Weiss Mark Allen, Pearson Education · 2014
2. The C++ Programming Language, 4th Edition, B. Stroutstrup, Pearson Education, 2013.