

B.Sc. (Hons.) Computer Science III Semester (NEP)

Data Structures Guidelines

| S. No. | Topic | Reference | Contents |
|---------------|---|----------------------------|--|
| 1 | Unit 1 - Growth of Functions, Recurrence Relations | [1] | Ch-4 4.1, 4.2: 4.2.1-4.2.5 |
| | | [2] | Ch-4: 4.3, 4.4, 4.5 |
| 2 | Unit 2 - Arrays, Linked Lists, Stacks, Queues, Deques | [1] | Ch-3: 3.1 (till page 114 – excluding tic-tac-toe) 3.2, 3.3, 3.4 |
| | | [1] | ch-5: 5.1, 5.2, 5.3: 5.3.1-5.3.3 |
| 3 | Unit 3 - Recursion | [1] | ch-3: 3.5 upto page 135, 3.5.1, 3.5.2 ch-4: 4.2.6 |
| 4 | *Unit 4 - Trees, Binary trees, Binary Search Trees, Balanced Search Trees | [1] | ch-7: 7.1, 7.2, 7.3.1-7.3.4, 7.3.6 upto page 299 ch-10: 10.1, 10.2 upto 10.2.1 (10.2.2 to be covered for practicals only) |
| | | OR Additional Ref (iii) | OR 6.1, 6.2, 6.3, 6.4 (upto 6.4.2; only recursive methods to be done in 6.4.2), 6.5 (excluding insertion into a threaded tree), 6.6 (excluding 6.6.1 – deletion by merging), 6.7 (except 6.7.1 – DSW algorithm) |
| 5 | Unit 5 - Binary Heap | [2] | ch-6: 6.1-6.3 |

*Unit 4 may be covered either from Additional Reference (iii) or Reference [1] as per the suggested guidelines.

References

1. Goodrich, M.T, Tamassia, R., & Mount, D., Data Structures and Algorithms Analysis in C++, 2nd edition. Wiley, 2011.
2. Cormen, T.H., Leiserson, C.E., Rivest, R. L., Stein C. Introduction to Algorithms, 4th edition, Prentice Hall of India, 2022.

Additional References

- (i) Sahni, S., Data Structures, Algorithms and applications in C++, 2nd edition, Universities Press, 2011.
- (ii) Langsam Y., Augenstein, M. J., & Tanenbaum, A. M. Data Structures Using C and C++, Pearson, 2009.
- (iii) Drozdek, A., Data Structures and Algorithms in C++, Fourth Edition. Cengage Learning.

Practicals List

1. Write a program to implement singly linked list as an ADT that supports the following operations:
 - i. Insert an element x at the beginning of the singly linked list
 - ii. Insert an element x at i^{th} position in the singly linked list
 - iii. Remove an element from the beginning of the doubly linked list
 - iv. Remove an element from i^{th} position in the singly linked list.
 - vi. Search for an element x in the singly linked list and return its pointer
2. Write a program to implement doubly linked list as an ADT that supports the following operations:
 - i. Insert an element x at the beginning of the doubly linked list
 - ii. Insert an element x at the end of the doubly linked list
 - iii. Remove an element from the beginning of the doubly linked list
 - iv. Remove an element from the end of the doubly linked list
3. Write a program to implement circular linked list as an ADT which supports the following operations:
 - i. Insert an element x in the list
 - ii. Remove an element from the list
 - iii. Search for an element x in the list and return its pointer
4. Implement Stack as an ADT and use it to evaluate a prefix/postfix expression.
5. Implement Queue as an ADT.
6. Write a program to implement Binary Search Tree as an ADT which supports the following operations:
 - i. Insert an element x
 - ii. Delete an element x
 - iii. Search for an element x in the BST
 - iv. Display the elements of the BST in preorder, inorder, and postorder traversal
7. Write a program to implement insert and search operation in AVL trees.