

DATA STRUCTURES – FALL 2023

Cyber Security Department

LAB 03

Learning Outcomes

In this lab you are expected to learn the following:

- Implementation of List Data Structure (Array-Based)

Lab Task

In this Lab we are going to implement List Data Structure using Arrays.

You have to make a class:

```
class List {  
private:  
    int *arr;  
    int size;  
    //constructor that initializes the array using DMA  
}
```

With the following member functions:

- 1) **Insert an Element at end of List**
- 2) **Insert an Element at start of list**
- 3) **Insert an Element at given position**
- 4) **Remove an Element from the start of the list**
- 5) **Remove an Element from the end of the list**
- 6) **Remove an Element from a given position**
- 7) **NEXT (p, L):** Return the position following p on list L.
- 8) **PREVIOUS (p, L):** Return the position preceding position p on list L
- 9) **Printing** the List
- 10) **Is Empty ()**
Returns True if List is empty else returns False
- 11) **Replace (on the basis of index and value)**
Replace any element of the List
- 12) **Clear the List:**
Deletes all the elements from the List
- 13) **Sort:**
Sort all the elements of the list in ascending order using any one of the three sorting algorithms i.e.,
Improved bubble sort, selection sort or insertion sort.
- 14) **Search:**
Searches for an element in the list and returns its index. If element is not found returns -1
- 15) **Duplicate Elements:**
Search for duplicate elements in list if duplicate Elements exist return True else return False

Test Plan (the operations in the List ADT)

Test case	Commands	Expected result	Checked
Insert at end	5	5	
	4	5 4	
Insert at start	6	6 5 4	
	1	1 6 5 4	
Remove data item	4	5 6 1	
Insert in middle	9 (Position 2)	5 6 9 1	
Display data item		5 6 9 1	
Replace data item	7 (With 6)	5 7 9 1	
sort		1 5 7 9	
Search	9	3	
is Empty		False	
Clear the list		Empty list	
Duplicate		False	