University of Central Punjab

**Faculty of Information Technology**

# Data Structures and Algorithms

# Summer 2024

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| **Lab 02** | |  |
| **Topic** | * Abstract Classes * Templates * Arrays |
| **Objective** | The basic purpose of this lab is to revise some preliminary concepts of C++ that has been covered in the course of Introduction to Computing and Programming Fundamentals and Object Oriented Programming. |
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**Instructions:**

* Indent your code.
* Comment your code.
* Use meaningful variable names.
* Plan your code carefully on a piece of paper before you implement it.
* Name of the program should be same as the task name. i.e. the first program should be Task\_1.cpp
* **void main() is not allowed. Use int main()**
* **You have to work in multiple files. i.e separate .h and .cpp files**
* **You are not allowed to use system**("**pause**")
* **You are not allowed to use any built-in functions**
* **You are required to follow the naming conventions as follow:**
  + **Variables:** firstName; (no underscores allowed)
  + **Function:** getName(); (no underscores allowed)
  + **ClassName:** BankAccount (no underscores allowed)

**Students are required to complete the following tasks in lab timings.**

## Task 1

Create a C++ generic abstract class named as **List**, with the following:

**Attributes:**

1. Type \* arr;
2. int maxSize;
3. int currentSize;

**Functions:**

virtual void addElement(Type) = 0;

* Should add the element at the last position of the **List**

virtual Type removeElement() = 0;

* Should remove the element from the last position of the **List**
* Write parameterized constructor with default arguments for the above class.
* Write Copy constructor for the above class.
* Write Destructor for the above class.

## Task 2

Using the class made in task 1, make a class named as **MyList**, having following additional functionalities:

**bool** [**empty()**](https://www.geeksforgeeks.org/stack-empty-and-stack-size-in-c-stl/) : Returns whether the MyList is empty or not

**bool** [**full()**](https://www.geeksforgeeks.org/stack-empty-and-stack-size-in-c-stl/) **:** Returns whether the MyList is full or not  
**int** [**size()**](https://www.geeksforgeeks.org/stack-empty-and-stack-size-in-c-stl/) : Returns the current size of the MyList   
**Type** [**last ()**](https://www.geeksforgeeks.org/stack-top-c-stl/) : Returns the last element of the MyList

* Write parameterized constructor with default arguments for the above class.
* Write Copy constructor for the above class.
* Write Assignment operator for the above class.
* Write indexing/subscript operator for the above class. Because you are not allowed to return memory handler of the array outside the class.
* Write Destructor for the above class.

## Task 3

Now write a global function show list which should display all the contents of the list.

void showList(MyList <Type> s);

**Hint:** Use indexing operator here

Instantiate several objects of MyList, test all the functions of MyList on them and then display them through showList function.