# Data Structures & Applications
# Spring 2021
# Lab 04 – Recursion

**Instructor: Saif Hassan** **Date: 25th July, 2021**

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**Instructions:**

- At the end of this Lab, you will have to submit all files on LMS.
- File format should be **`.zip/.rar`** file containing required **`.java`** files and additional if required.
- File Name should be your **`CMSID_Name_Lab04.zip.`**
- Create a project named lab04_dsa and perform following tasks.

**Note: Keep this code with you till the course ends.**

## Task 00: (Simple Recursion)

a) Write a program to ask user input N and print numbers from 1 – N in ascending/descending order. (using recursion)
b) Print 1d character array values using recursion in forward/reverse direction.

## Task 01: (Fibonacci Series)

a) Write a program to generate Fibonacci series till N. N is any user input. (Using iterative approach)
b) Write a program to generate Fibonacci series till N. N is any user input. (Using recursive approach)
c) Calculate and compare time, whether a or b takes less time **(using code).**

## Task 02: (Factorial)

a) Design a method to calculate factorial of N number where N is any user input. (Using iterative approach)
b) Design a method to calculate factorial of N number where N is any user input. (Using recursive approach)
c) Calculate and compare time, whether a or b takes less time **(using code)**.

## Task 03: (Printing Linkedlist):

a) Write a program to print all nodes from linkedlist. (Using iterative approach)

b) Write a program to print all nodes from linkedlist. (Using recursive approach)
c) Calculate and compare time, whether a or b takes less time **(using code).**

# Practice Tasks for Stack, LinkedList

## Task 04: (Search using recursion)

Write a program to store random values in array of integers and ask user any input Search, find out whether Search value is present in array or not. (Using recursion/Iterative) and compare time of both

If present then return 1 otherwise 0.

## Task 05: (Reverse linked list)

You have worked on all types of linkedlist, now design a method for single linked list that will reverse the linked list. Same linked list will be in reverse direction. You are given head of linked list and just have to change next pointer of nodes so that list may be reversed.

```
Public Node makeReverse(Node head)
```

## Task 06: (Print in reverse order)

You are asked to design a method in linked list to print data in reverse order. You don't need to reverse linkedlist permanently.

```
Public void printReverse()
```

## Task 07: (Cycle Detection):

Write a method in linkedlist class that will detect cycle in list?

## Task 08: (Balanced Brackets)

We have discussed in class about Balanced brackets problem using Stack. Take user string input and check whether it's balanced or not. Use stack functions. Input may contain any of the bracket among {, [, ( and any number and letters like: ({[a+b]+c}-1) and so on.