# MA144: Problem Solving and Computer Programming

## Lecture – 1: Introduction


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# Course Outcomes

| Course Code: MA144 | PROBLEM SOLVING AND COMPUTER PROGRAMMING | Credits 3-0-2: 4 |
|---|---|---|

At the end of this course,
the student will be able to

| | |
|---|---|
| **CO1** | Design algorithms for solving simple mathematical problems including computing, searching and sorting |
| **CO2** | Compare and contrast algorithms in terms of space and time complexity to solve simple mathematical problems |
| **CO3** | Explore the internals of computing systems to suitably develop efficient algorithms |
| **CO4** | Examine the suitability of data types and structures to solve specific problems |
| **CO5** | Apply control structures to develop modular programs to solve mathematical problems |
| **CO6** | Apply object oriented features in developing programs to solve real world problems |

# Syllabus

**Fundamentals of Computers**: Historical perspective, Early computers, Components of a computers, Problems, Flowcharts, Memory, Variables, Values, Instructions, Programs.

**Problem solving techniques**: Algorithmic approach, characteristics of algorithm, Problem solvingstrategies:Top-downapproach,Bottom-upapproach,Timeandspacecomplexitiesof algorithms.

**Numbersystemsanddatarepresentation**:BasicsofC++,Basicdatatypes,Numbers,Digit separation, Reverse order, writing in words, Development of Elementary School Arithmetic Testing System, Problems on Date and factorials, Solutions using flow of control constructs,

**Conditional statements**: If-else, Switch-case constructs, Loops - while, do-while, for.

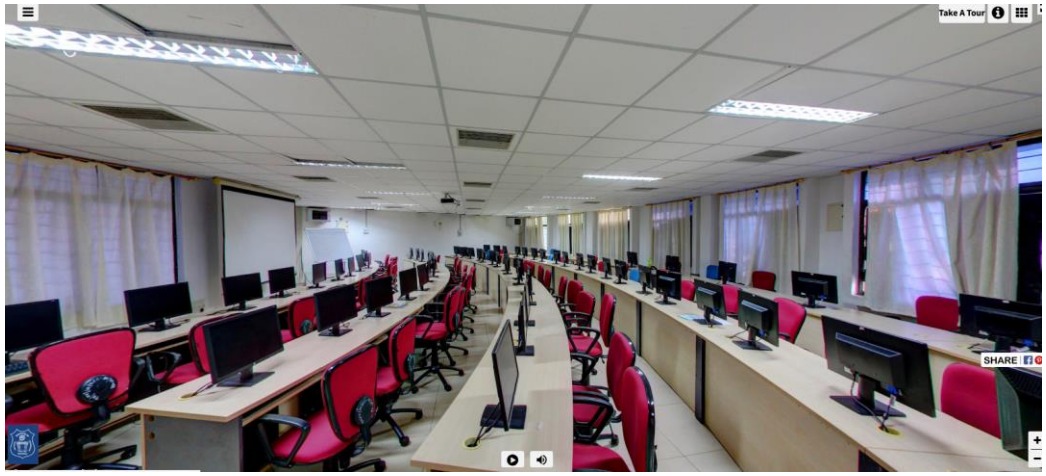
**Functions**: Modular approach for solving real time problems, user defined functions, library functions, parameter passing - call by value, call by reference, return values, Recursion,

**Introduction to Pointers and Arrays**: Sorting and searching algorithms, Large integer arithmetic, Single and Multi-Dimensional Arrays, passing arrays as parameters to functions, Magic square and matrix operations using Pointers and Dynamic Arrays, Multidimensional Dynamic Arrays

**String processing, File operations**.

**Structures and Classes**: Declaration, member variables, member functions, access modifiers,functionoverloading,ProblemsonComplexnumbers,Date,Time,LargeNumbers.

# Lab Syllabus




PSCP LAB:

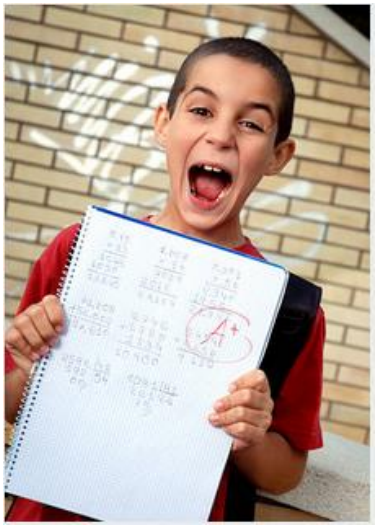
1. Programs on conditional control constructs.
2. Programs on loops (while, do-while, for).
3. Programs using user defined functions and library functions.
4. Programs on arrays, matrices (single and multi-dimensional arrays).
5. Programs using pointers (int pointers, char pointers).
6. Programs on structures.
7. Programs on classes and objects.

Learning Resources:

Text Books:

1. Problem Solving with C++, **Walter Savitch**, Pearson, 2014, Ninth Edition
2. Big C++, **Cay Horstmann**, Wiley, 2009, Second Edition

# Scheme of Evaluation (independent grading)

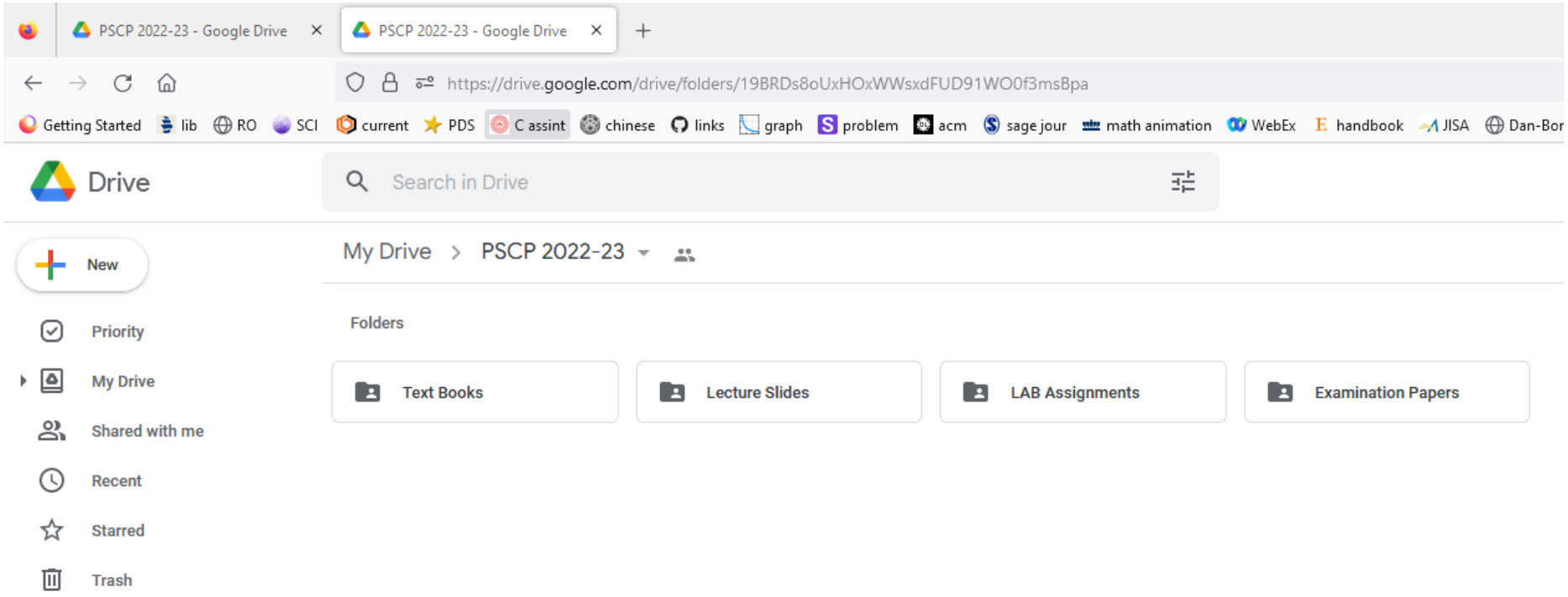


This course is evaluated for 100 marks, with the following weightages

| | Examination | Weightage in Marks |
|---|---|---|
| Theory | Class Test – 1 | 15 |
| | Class Test – 2 | 30 |
| | End – Semester Examination | 30 |
| Lab | Lab Record | 10 |
| | Attendance | 5 |
| | Lab Test | 10 |
| | Total | 100 |

# Materials Link

https://drive.google.com/drive/folders/19BRDs8oUxHOxWWsxdFUD91WO0f3msBpa?usp=share_link



# Materials Link (contd...)

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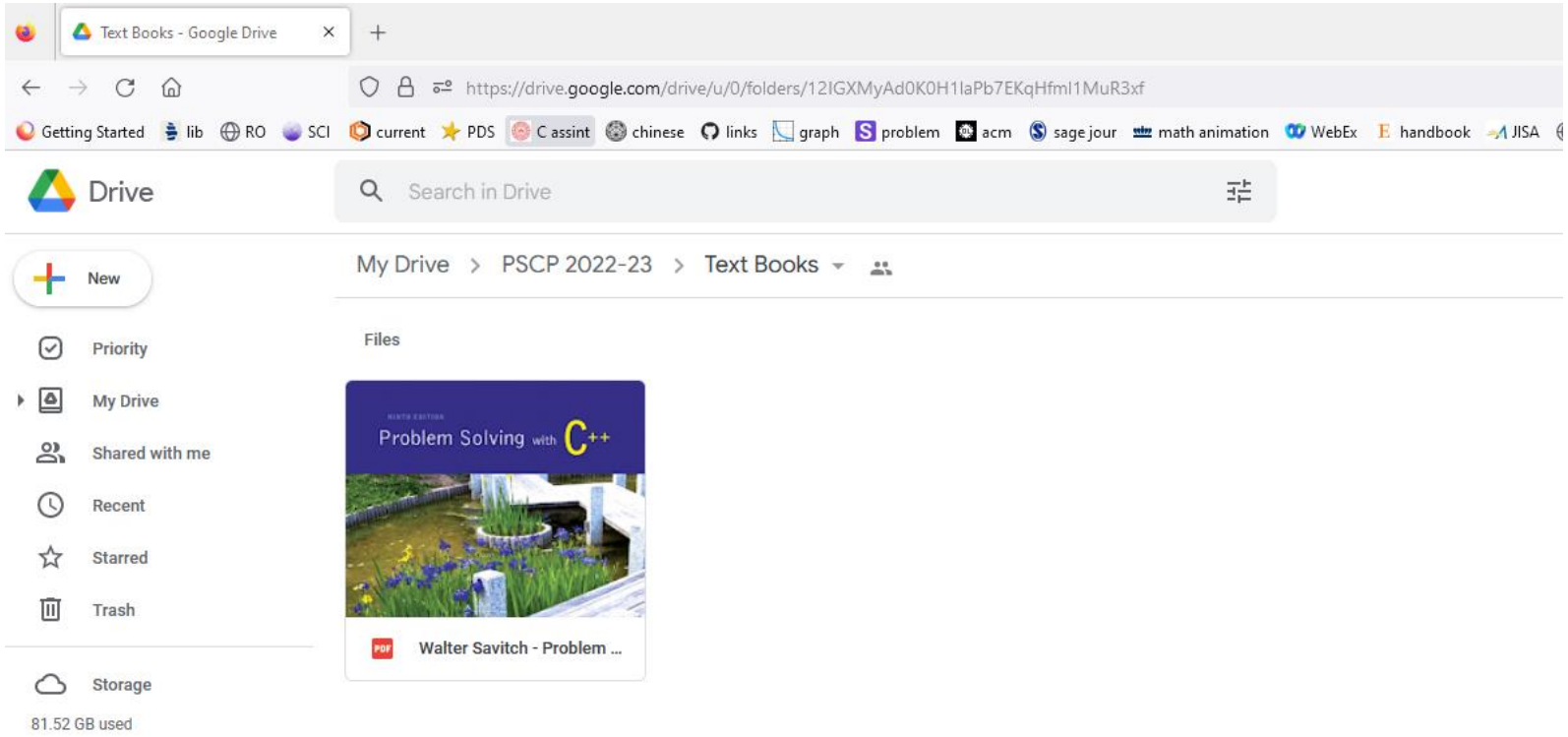
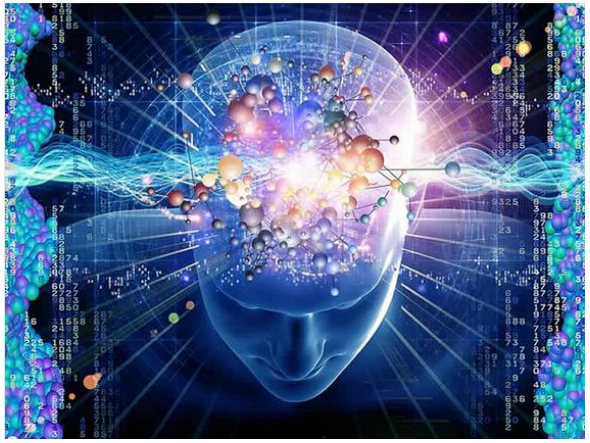
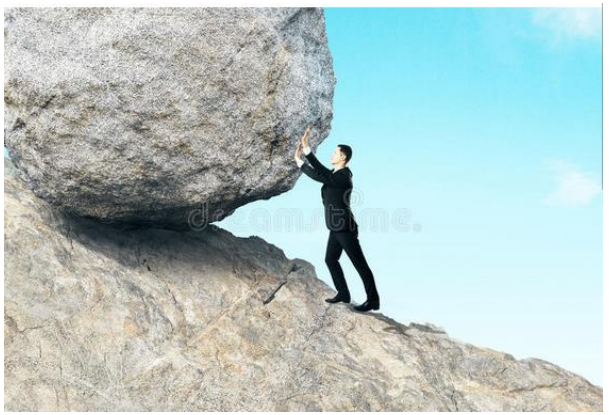


# Not Needed (for this course)

- Great Intelligence



- Too much of Hard Work



# Needed (for this course)

- **I**nterest
- **P**atience
- **E**nthusiasm

# Excel Yourself by

- **A**ttentiveness

- **A**nalysis


- **A**pproach

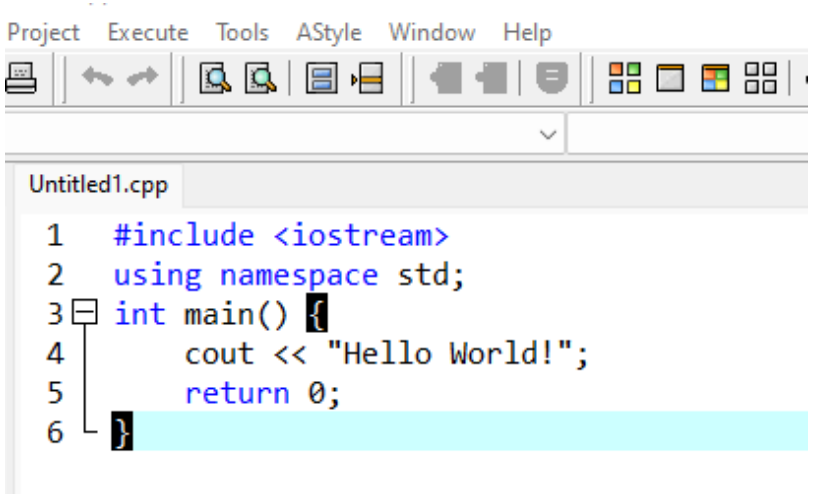
# Basic Components of a Computer

# Programming and Software

- A computer needs to be programmed to perform tasks
- Programming is the process of writing instructions in a language that can be understood by the computer so that a desired task can be performed by it
- Program is a sequence of instructions to do a task, computer processes the instructions sequentially one after the other
- Software: programs for doing tasks on computers

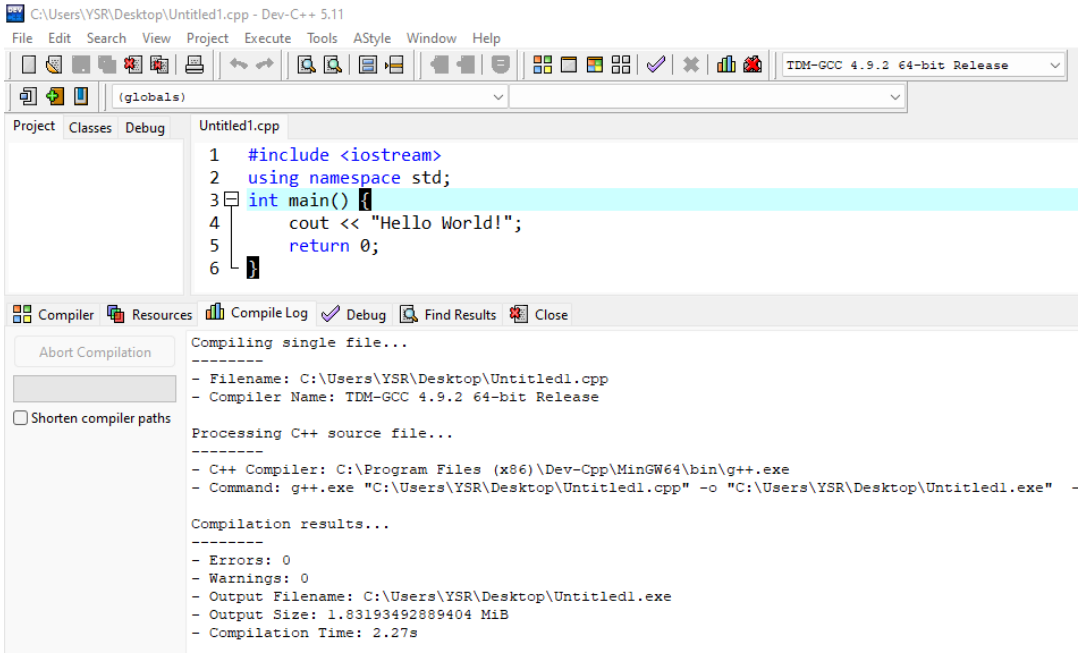
# Three Steps in Writing Programs

**Step 1:** Write the program in a high-level language (in this course, C++) (called source program or source code)



# Three Steps in Writing Programs (contd...)

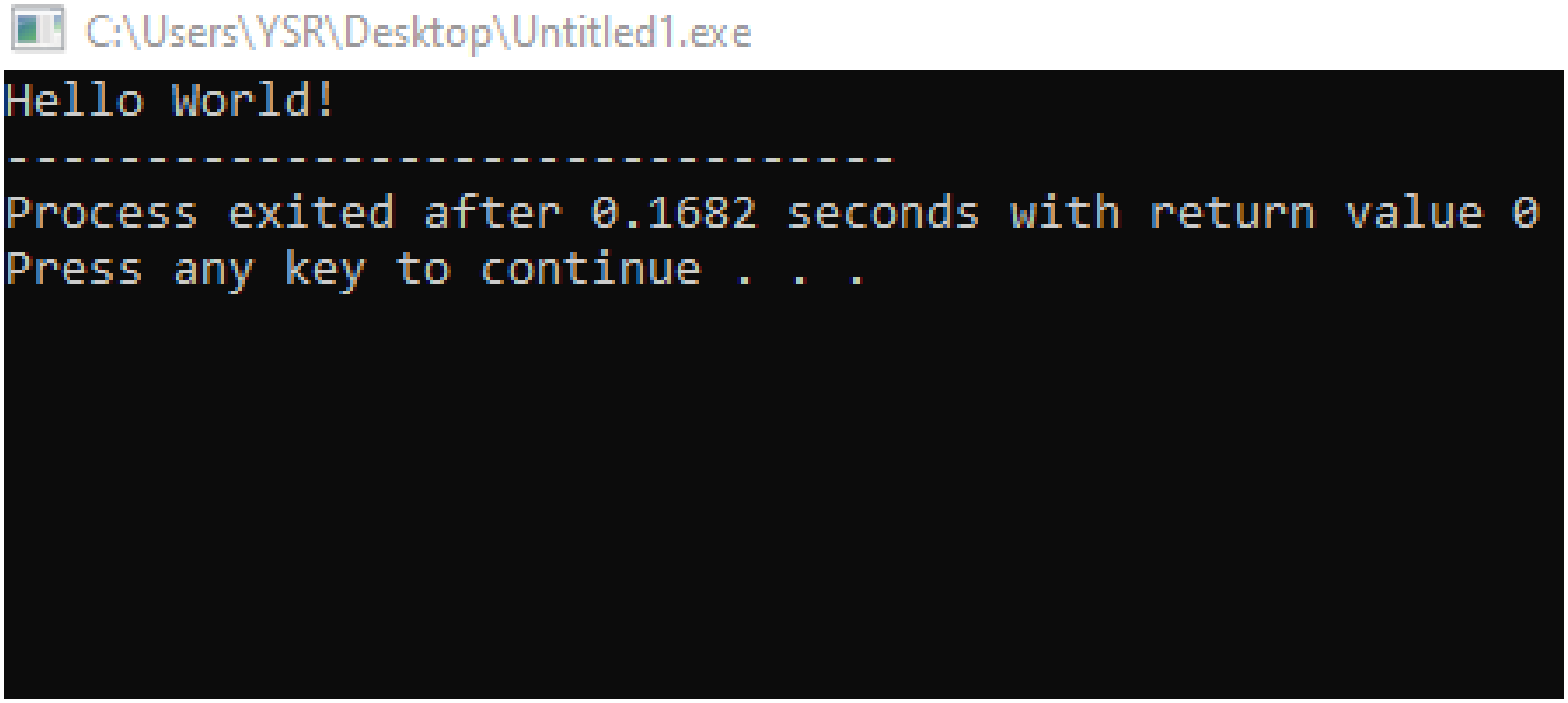
**Step 2:** Compile the program using a C++ compiler



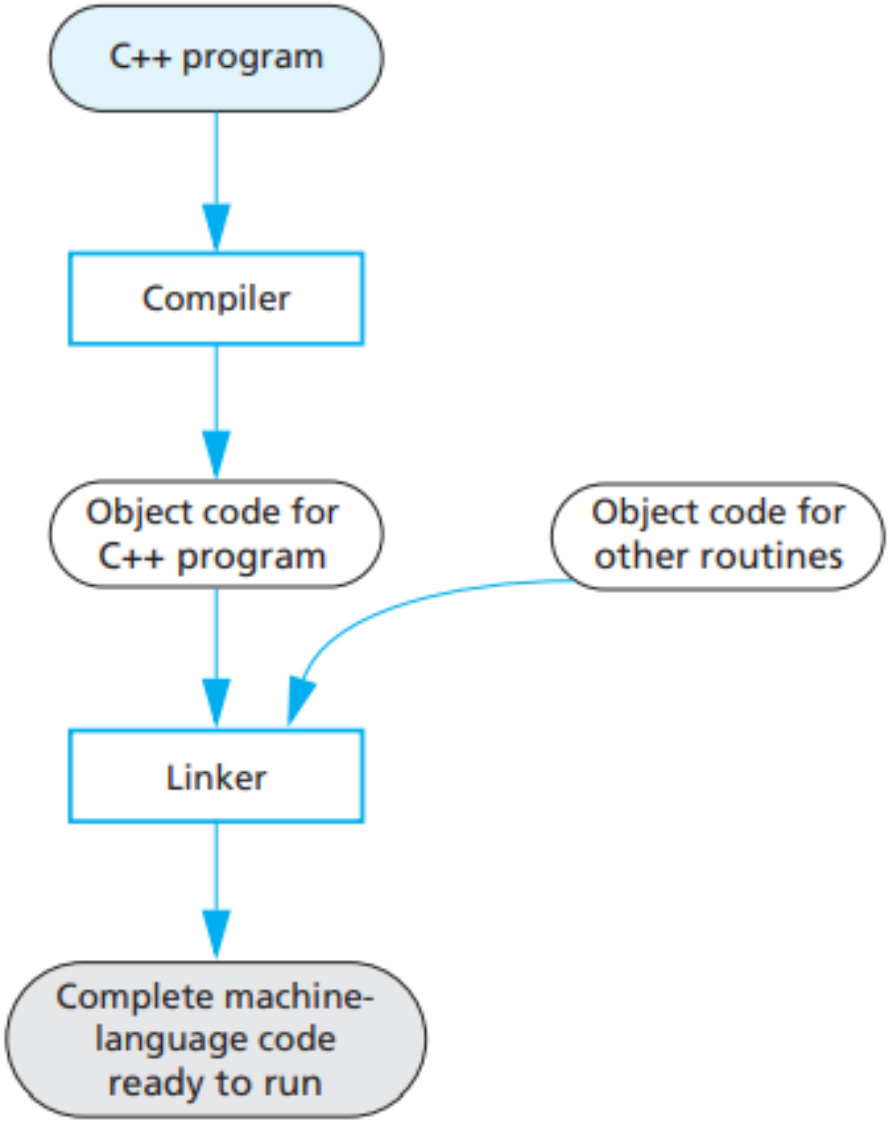

- Translates a source program or source code, into the object program or object code (computer can understand and execute it).

# Three Steps in Writing Programs (contd...)

**Step 3:** Run the program (the computer executes it)



# Preparing a C++ Program for Running



# Sample Program

```
#include <iostream>
using namespace std;
int main()
{
    cout << "Hello World!";
    return 0;
}
```

```
Hello World!
```

# Lab Activity

**Slot:** Every Tuesday, 2-4 pm

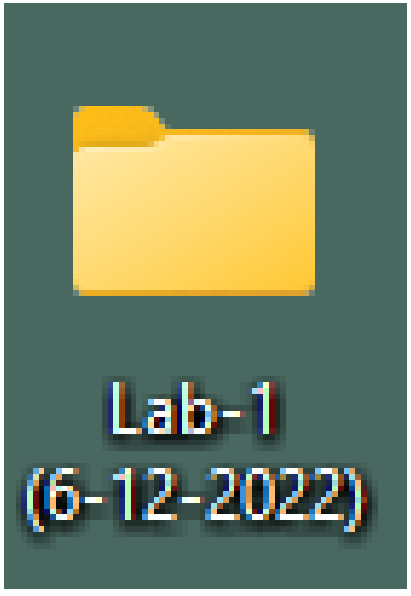
**Task:**

- Write and run the programs being discussed during lectures
- Write and run the programs which are given in Lab assignments

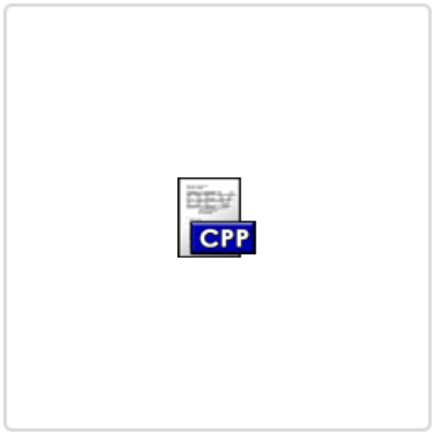
**Backup:** Save all the programs of each lab in a separate folder, with title

**Lab-k (date)**

**Save this folder in your drive**

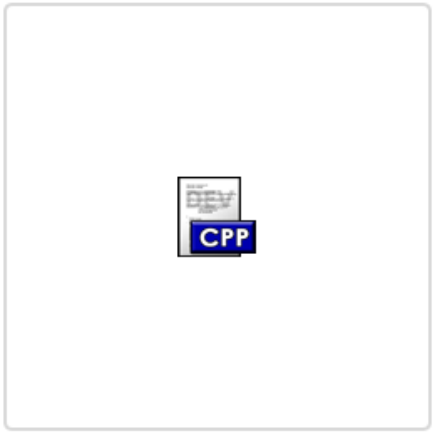
# Folder Should Contain ...




Hello world

Hello world


Hello world




Sum of two integers


Sum of two integers

Sum of two integers

# Lab Record

**Write a program to read two integers from keyboard and print their sum.**

```
#include <iostream>
using namespace std;
int main() {
   int a,b,sum;
   cout << "Enter two integers  ";
   cin>> a>>b;
        sum=a+b;
        cout << "sum=" <<sum;
   return 0;
}
```

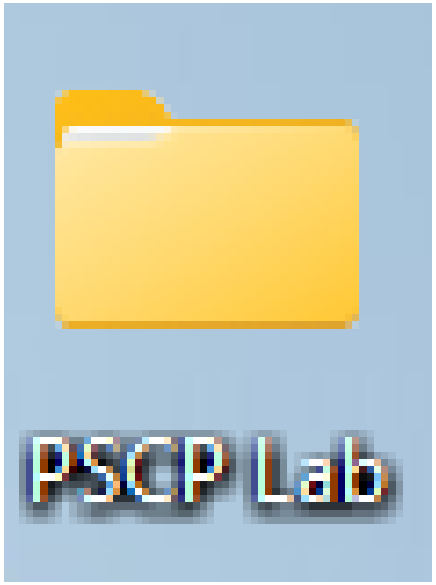
Times New Roman
Size 12 (in bold style)

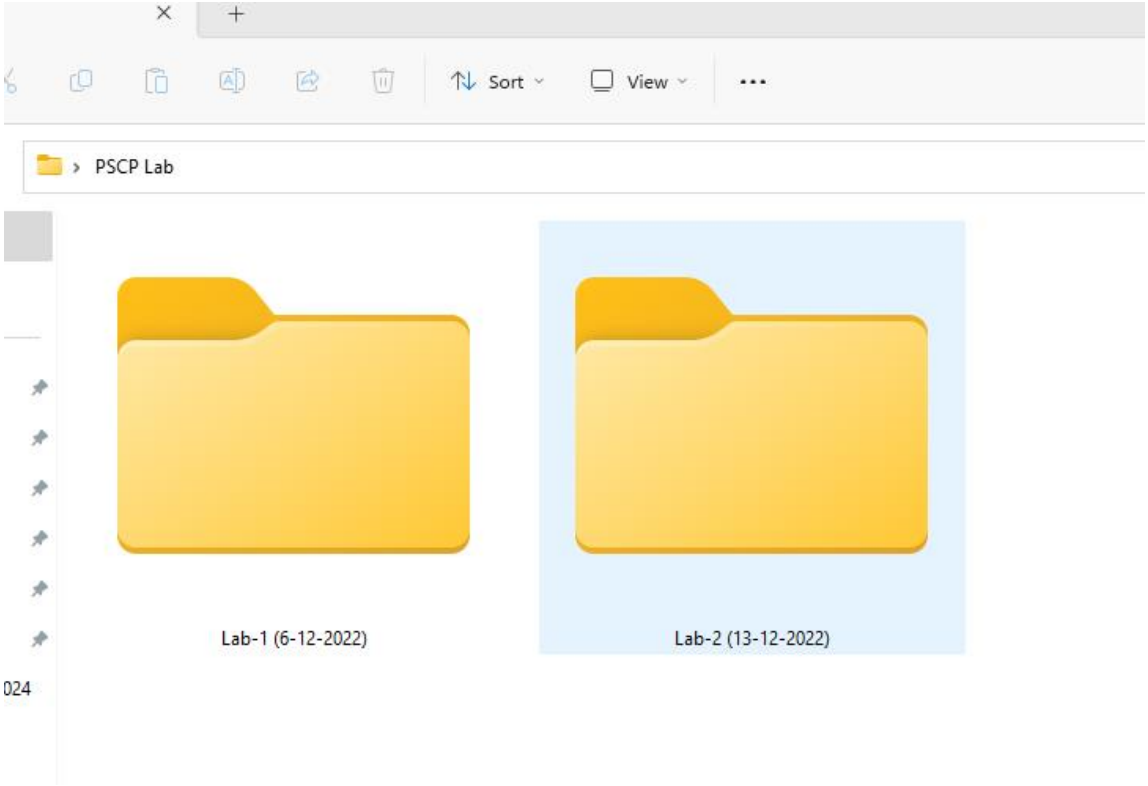
Book Antiqua
Size 12

Times New Roman
Size 12

```
Enter two integers  9 10
sum=19
```

# PSCP Lab Folder



# Lab Record Submission

- Select 30 non-trivial and interesting programs
- Get printouts
- Submit the printouts in paper binding,

  during lab test

# Lab Record : First Page Format

## MA144: Problem Solving and Computer Programming

## Lab Record

Name:

Roll No.:

Branch: I BTech (ECE)

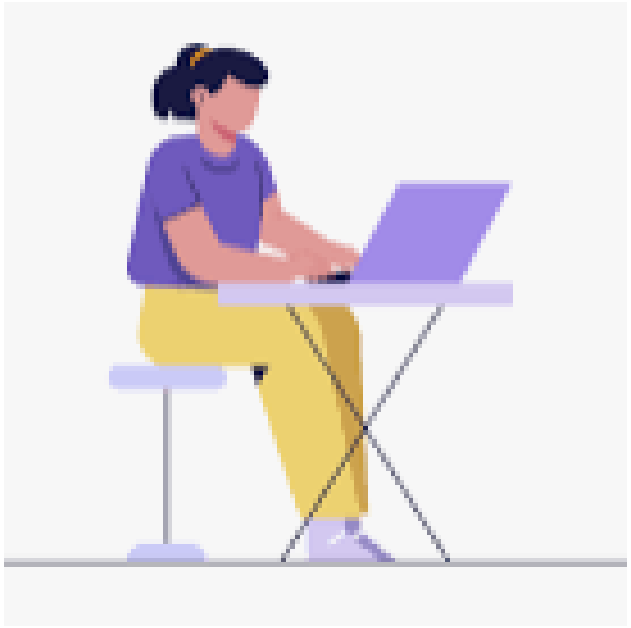
Section: C

Academic Year: 2022-23

# Communication Medium

- Create a WhatsApp group with title **PSCP_2022-23**
- Everyone can post any message regarding this course in this group

# Discipline is very essential



# Next Lecture

## Historical Perspective, Early Computers