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NEW CAIRO
TECHNOLOGICAL
UNIVERSITY

TUE – The Technological Universities in Egypt

NCTU – New Cairo Technological University

Faculty of Industry and Energy Technology

Information Technology Department

Second-Year

Course: Programming Essentials in C++

Lecture 1

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Contents:

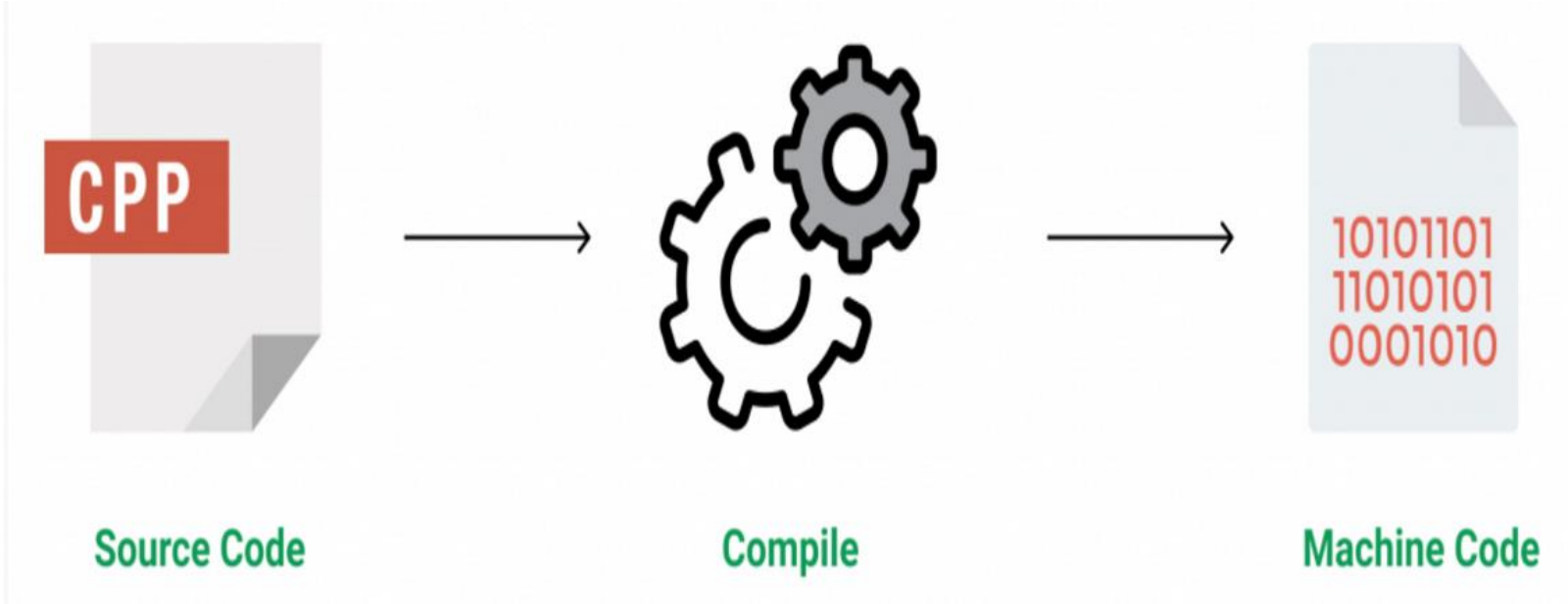
- Aim of course
- Introduction
- Basic Definitions
- First C++ Program

Aim of course

The aim of this course is to introduce students to the basic concepts of Programming. This course presents the easiest way to learn the basics of C++ from the ground up. By the end of the course you will have a thorough knowledge of C++ language and would be able to implement it with ease.

Introduction:

C++ is a general-purpose programming language that was developed as an enhancement of the C language to include object-oriented paradigm. It is an imperative and a compiled language.



Basic Definitions

- Programming
- Steps of solving problem
- Program Development Life Cycle
- The Problem Analysis Coding Execution Cycle
- Algorithm
- Language of a Computer
- Programming language
- Computer program
- Syntax
- Computer System

Basic Definitions

- **Programming** is a process of problem solving
- Steps of solving problem:

Step 1 : Analyze the problem

- Outline the problem and its requirements
- Design steps (**algorithm**) to solve the problem

Step 2 : Implement the algorithm

- Implement the algorithm in code
- Verify that the algorithm works

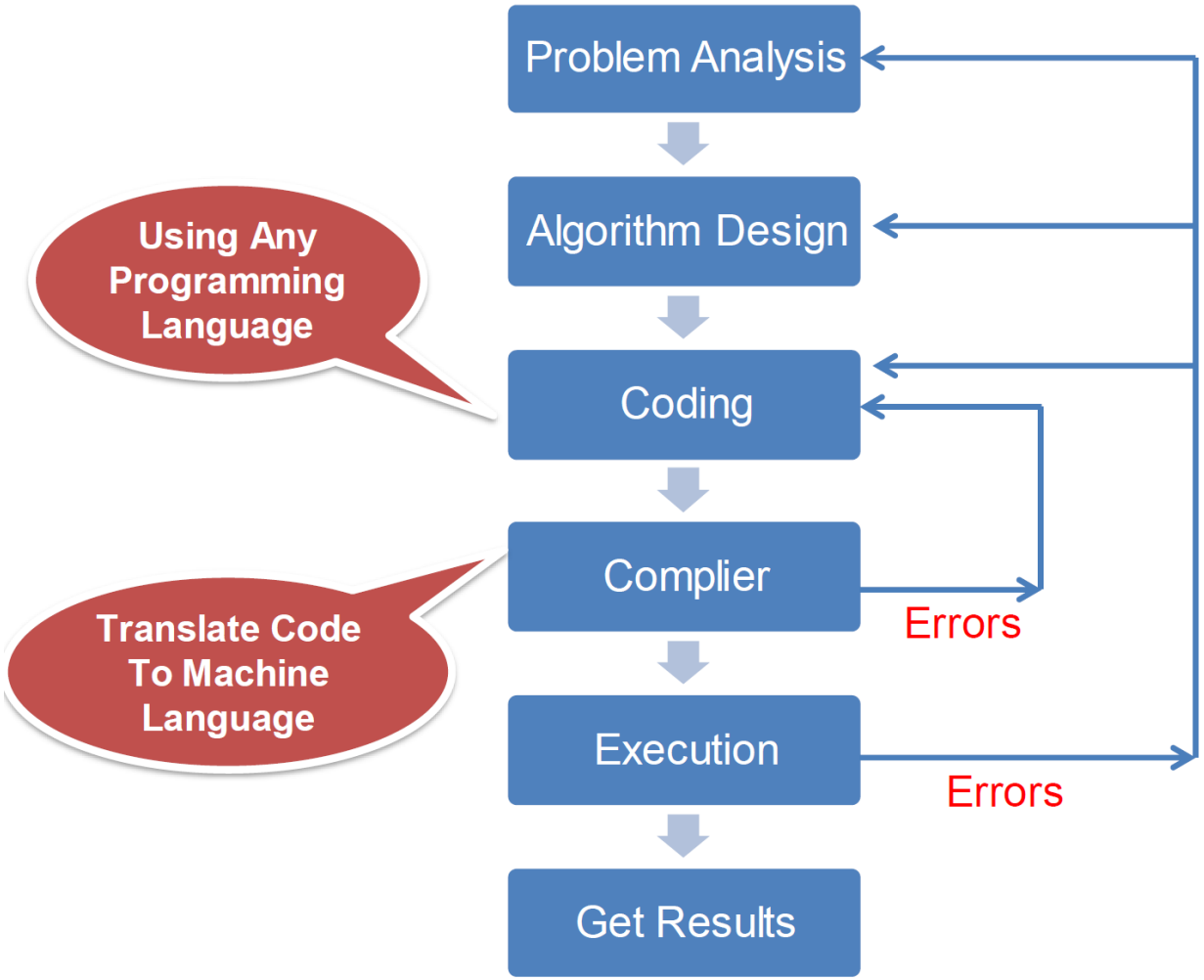
Step 3 : Maintenance

- Use and modify the program if the problem domain changes

Algorithm

Step by step problem solving process

Program Development Life Cycle



The Problem Analysis Coding Execution Cycle

- **Understand the Overall problem**

- **Understand problem requirements**
  - Does program require user interaction?
  - Does program manipulate data?
  - What is the output?

- **If the problem is complex, divide it into subproblems**
  - Analyze each subproblem as above

Understand problem requirements:

Example 1: Write a program to find the Area of a rectangle

The area of the Rectangle are given by the following formula:
Area = Rectangle Length * Rectangle Width.

Input :

Rectangle Length , Rectangle Width.

Processing :

Area = Rectangle Length * Rectangle Width.

Output :

Print Out The area.

The Problem Analysis Coding Execution Cycle

- **Run code through compiler**
- **If compiler generates errors**
  - Look at code and remove errors
  - Run code again through compiler
- **If there are no syntax errors**
  - Compiler generates equivalent machine code
- **Linker links machine code with system resources**
- **Once compiled and linked, loader can place program into main memory for execution**
- **The final step is to execute the program**
- **Compiler guarantees that the program follows the rules of the language**
  - Does not guarantee that the program will run correctly

The Language of a Computer

- **Machine language**
  - Binary digit (bit) bit):

    The digit 0 or 1
  - Binary code :

    A sequence of 0 s and 1 s
  - Byte

    A sequence of eight bits

Example 2:

To calculate wages = rates * hours in machine language:

```
100100 010001        //Load
100110 010010        //Multiply
100010 010011        //Store
```

The Language of a Computer

- Assembly language instructions are mnemonic
- Assembler : translates a program written in assembly language into machine language

Assembly Language	Machine Language
LOAD	100100
STOR	100010
MULT	100110
ADD	100101
SUB	100011

The Language of a Computer

Using assembly language instructions,

wages = rates • hours

can be written as:

LOAD rate

MULT hour

STOR wages

The Language of a Computer

❖High level languages include Basic, FORTRAN, COBOL, Pascal, C, C++, C#, and Java

- Compiler : translates a program written in a high level language machine language

- The equation wages = rate • hours can be written in C++ as:
- wages = rate * hours;

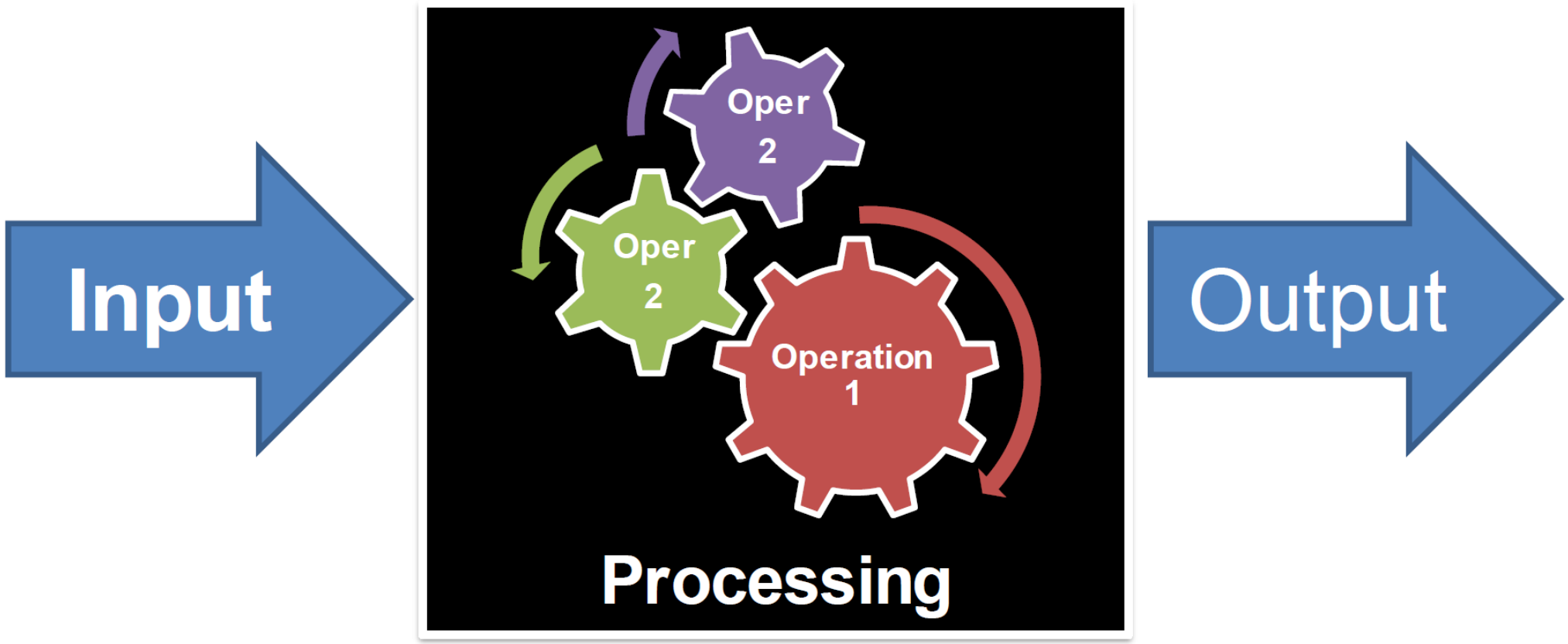
- Programming language is a set of rules, symbols, and special words used to write computer programs.

- Computer program is a sequence of statements whose objective is to accomplish a task.

Syntax:

rules that specify which statements (instructions) are legal

Computer System

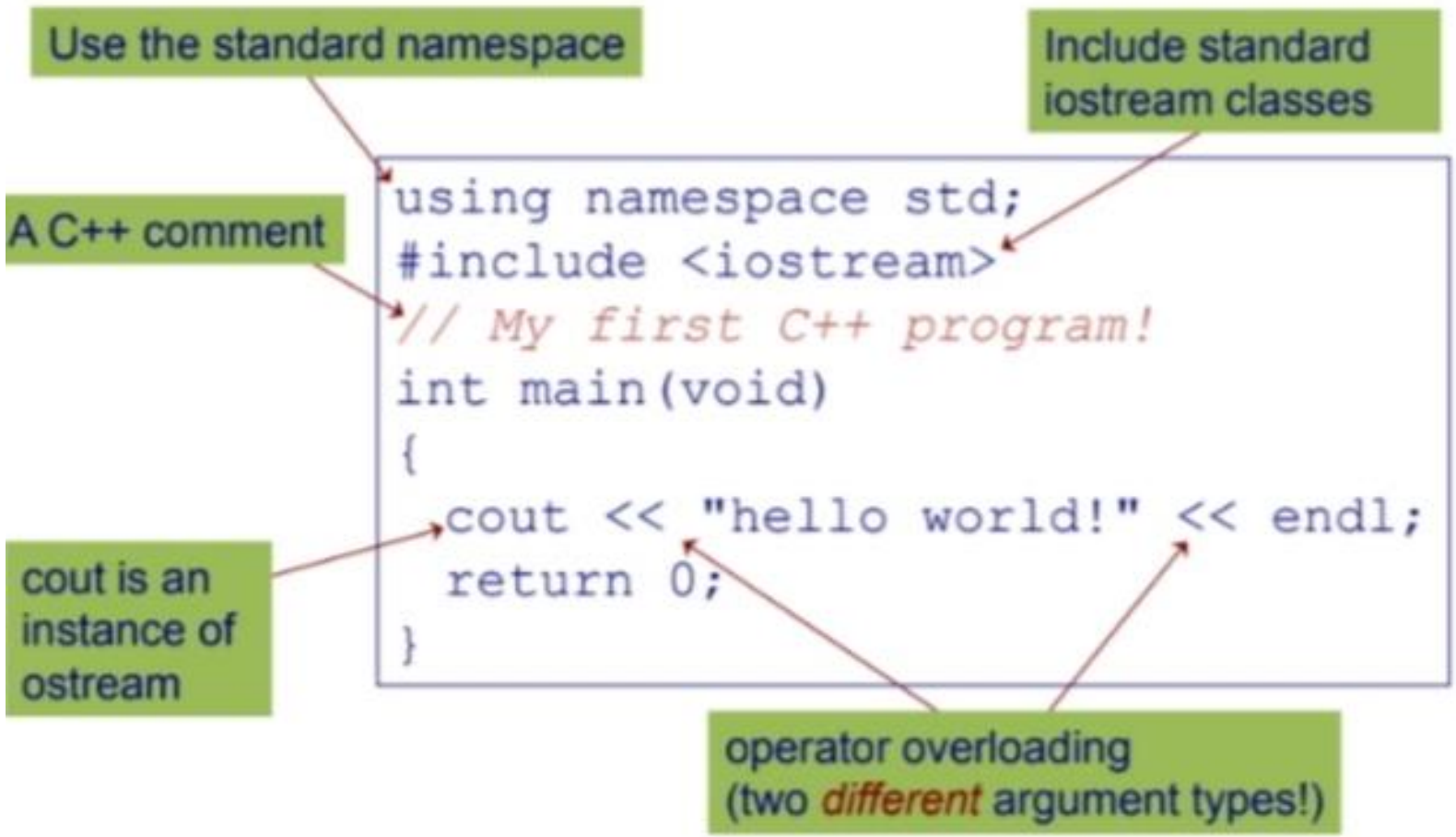


First C++ Program

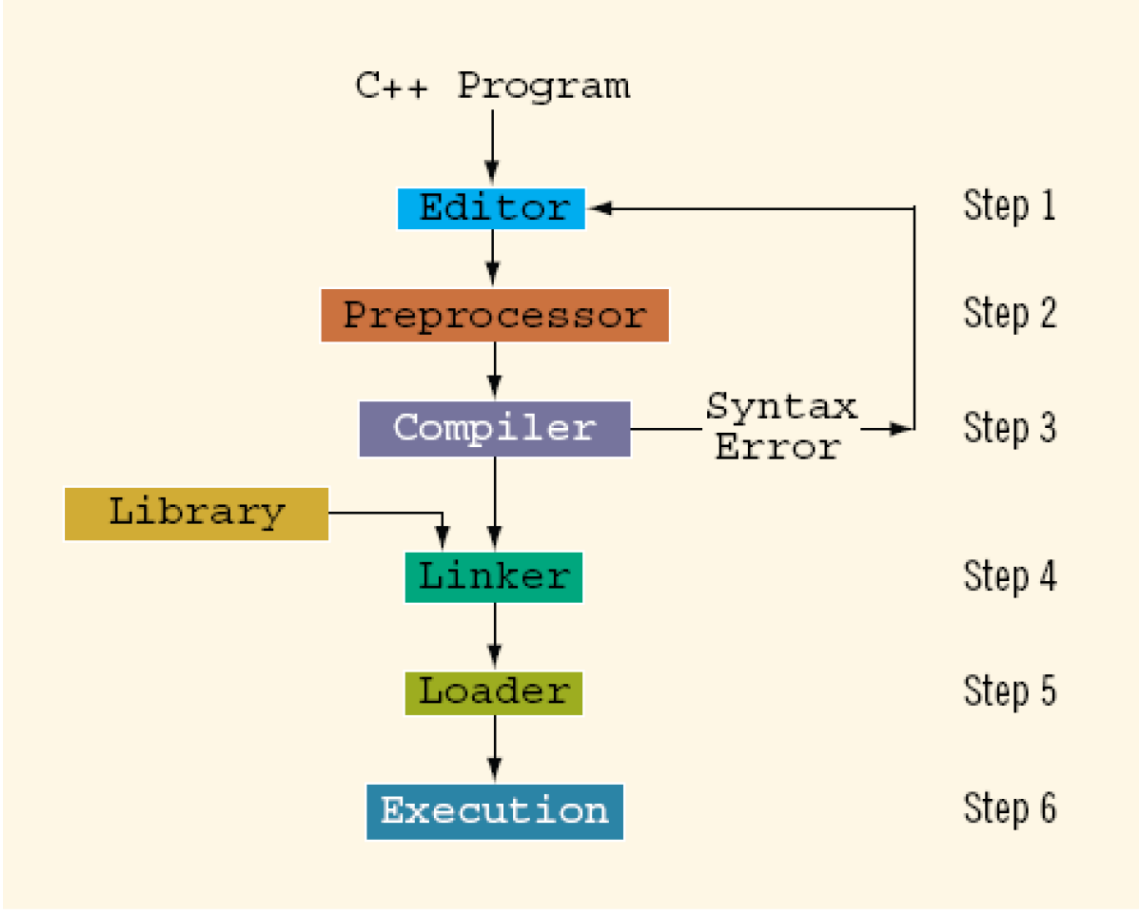

```
#include <iostream>
using namespace std;
Int main()
{
// This is first program
cout << “Hello world!" << endl;
Return 0;
}
```

Run:

- Hello world!


Use the standard namespace
Include standard iostream classes
A C++ comment
using namespace std;
#include <iostream>
// My first C++ program!
int main(void)
{
cout << "hello world!" << endl;
return 0;
}
cout is an instance of ostream
operator overloading
(two different argument types!)

Processing a C++ Program



Processing a C++ Program

To execute a C++ program:

- Use an editor to create a source program in C++
- Preprocessor directives begin with # and are processed by a the preprocessor
- Use the compiler to:
  - -Check that the program obeys the rules
  - -Translate into machine language (object program
- Linker :
  - -Combines object program with other programs provided by the SDK to create executable code
- Loader :
  - -Loads executable program into main memory
- The last step is to execute the program