

**Don Bosco Institute of Technology, Kurla(W)**  
**Department of Electronics and Tele-Communication Engineering**  
**ECL304 - Skill Lab: C++ and Java Programming**  
**Sem III**  
**2021-22**

<b>Lab Number:</b>	<b>6</b>
<b>Student Name:</b>	<b>Sanskar Kumar</b>
<b>Roll No :</b>	<b>35</b>

**Title:**

1. To perform Multiple Inheritance in C++. Create a student class representing student roll number, name and branch and an exam class (derived class of student) representing the scores of the student in various subjects (maths, physics and chemistry) and sports class representing the score in sports. The sports and exam class is inherited by a result class which adds the exam marks and sports score to generate the final result.
2. To perform Hierarchical Inheritance in C++. Create an Employee class with attributes EmpID and EmpSalary. Also create necessary methods/constructors to accept these values from the user. Create classes permanentEmployee and TemporaryEmployee which will be derived classes of Employee. Mention hike attribute in these derived classes and calculate the total salary using generate\_salary() method for respective types of employees. Objects of the derived classes should be created and salaries for the permanent and temporary employees should be calculated and displayed on the screen.

**Learning Objective:**

- Students will be able to perform multiple inheritance using C++.

**Learning Outcome:**

- Understanding the inheritance concept and reusability of the code.

**Course Outcome:**

<b>ECL304.2</b>	Comprehend building blocks of OOPs language, inheritance, package and interfaces
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**Theory:**

- Explain in details about inheritance, its types, syntaxes and block diagrams in C++.

## **INHERITANCE**

In C++, inheritance is a process in which one object acquires all the properties and behaviors of its parent object automatically. In such way, you can reuse, extend or modify the attributes and behaviors which are defined in other class.

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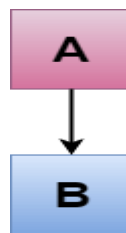
In C++, the class which inherits the members of another class is called derived class and the class whose members are inherited is called base class. The derived class is the specialized class for the base class.

## **TYPES**

### **Single Inheritance**

Single inheritance is defined as the inheritance in which a derived class is inherited from the only one base class.

#### **BLOCK DIAGRAM**



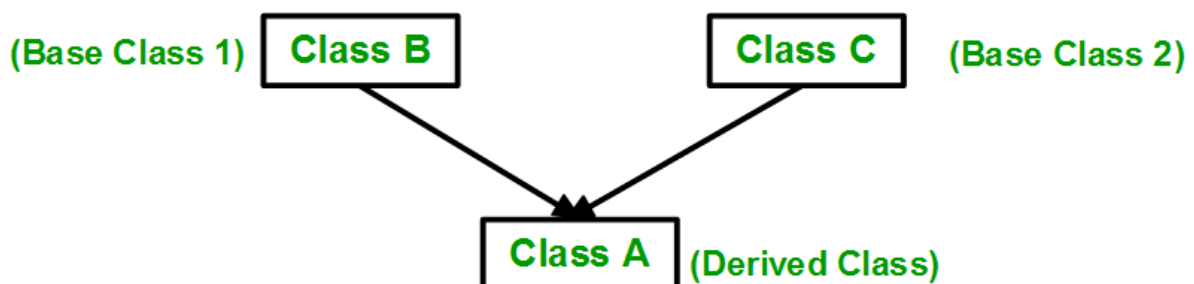
#### **SYNTAX**

```
class subclass_name : access_mode base_class
{
    //body of subclass
};
```

### **Multiple Inheritance**

Multiple Inheritance is a feature of C++ where a class can inherit from more than one classes. i.e one sub class is inherited from more than one base classes.

#### **BLOCK DIAGRAM**



#### **SYNTAX**

```
class subclass_name : access_mode base_class1, access_mode base_class2, ....
{
    //body of subclass
}
```

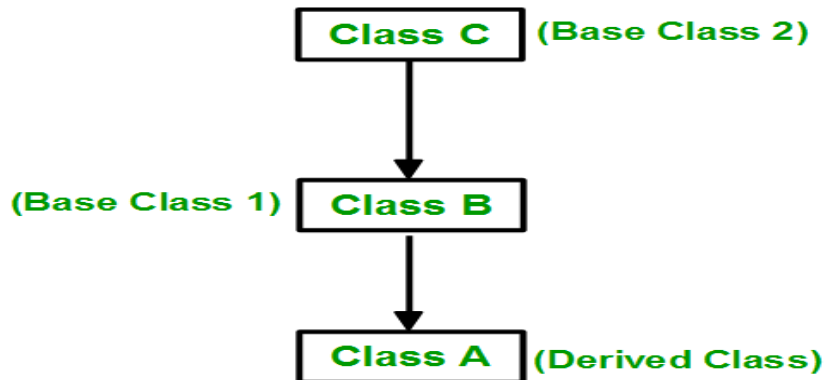
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};

**Multilevel Inheritance:**

In this type of inheritance, a derived class is created from another derived class.

**BLOCK DIAGRAM**



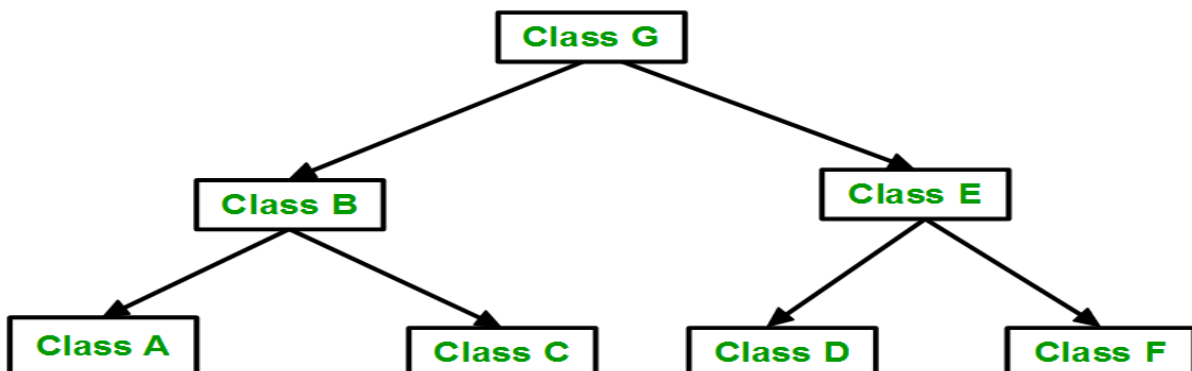
**SYNTAX**

```
class A {  
.....};  
  
class B : public A {  
.....};  
  
class C : public B {  
.....};
```

**Hierarchical Inheritance:**

In this type of inheritance, more than one sub class is inherited from a single base class. i.e. more than one derived class is created from a single base class.

**BLOCK DIAGRAM:**



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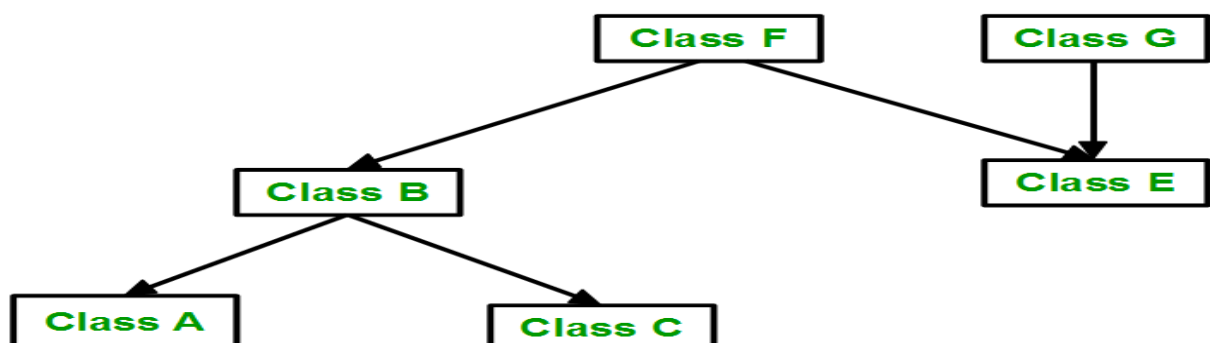
**SYNTAX**

```
class A // base class
{
    .....
};
class B : access_specifier A // derived class from A
{
    .....
};
class C : access_specifier A // derived class from A
{
    .....
};
class D : access_specifier A // derived class from A
{
    .....
};
```

**Hybrid Inheritance:**

Hybrid Inheritance is implemented by combining more than one type of inheritance. For example: Combining Hierarchical inheritance and Multiple Inheritance.

**BLOCK DIAGRAM:**



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**SYNTAX:**

```
class A
{
    .....
};

class B : public A
{
    .....
};

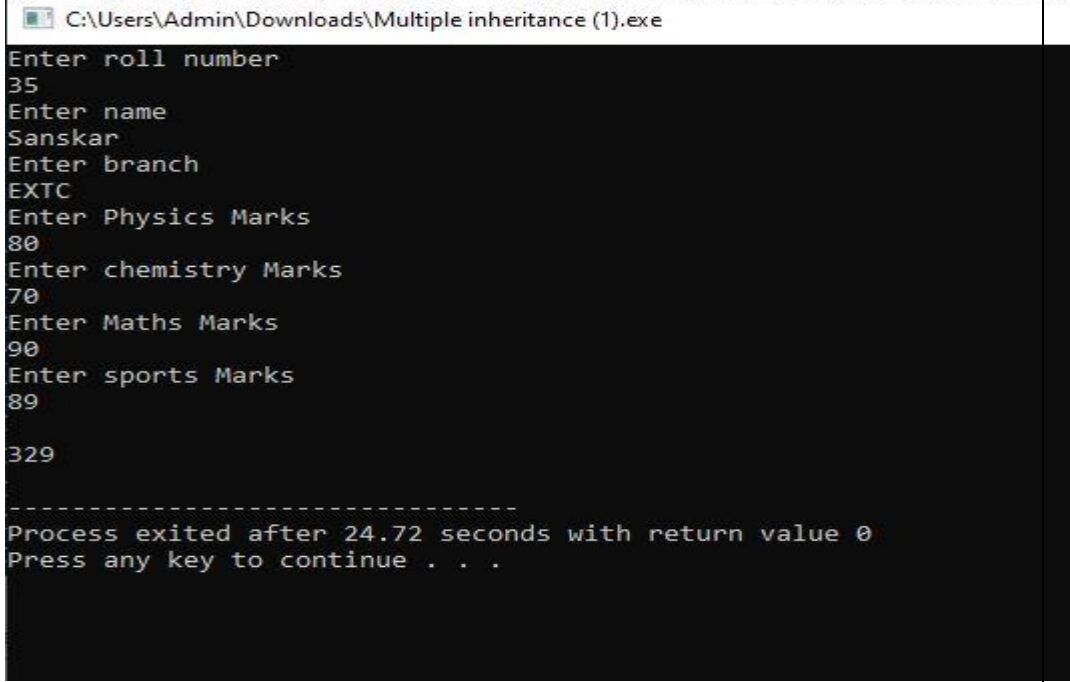
class C
{
    .....
};

class D : public B, public C
{
    .....
}
```

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<b>Algorithm</b> :	Step1: start Step2: Declare base class student Step3: int roll no, string name, string branch Step4: Get input from the user Step5: Create inheritance Step6: int maths, physics, chem Step7: Get input from user Step8: Create class sports Step9: int sports Step10: get value Step 11: create multiple inheritance Step12:Result Step13: Stop
<b>Program:</b>	<a href="https://github.com/SanskarKumar777/Skill-Lab-with-OOPM/commit/7efc695d8a9b3a637de37ad1c9c29edbb339c6ee">https://github.com/SanskarKumar777/Skill-Lab-with-OOPM/commit/7efc695d8a9b3a637de37ad1c9c29edbb339c6ee</a>
<b>Input given:</b>	35 Sanskar Kumar EXTC

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<b>Output Screenshot :</b>	 <p>The screenshot shows a Windows command prompt window titled "C:\Users\Admin\Downloads\Multiple inheritance (1).exe". The program prompts for the following inputs: roll number (35), name (Sanskar), branch (EXTC), Physics Marks (80), Chemistry Marks (70), Maths Marks (90), and sports Marks (89). It then displays the output "329". At the bottom, it shows "Process exited after 24.72 seconds with return value 0" and "Press any key to continue . . .".</p>
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<b>PROGRAM</b>	<a href="https://github.com/SanskarKumar777/Skill-Lab-with-OOPM/commit/7efc695d8a9b3a637de37ad1c9c29edbb339c6ee">https://github.com/SanskarKumar777/Skill-Lab-with-OOPM/commit/7efc695d8a9b3a637de37ad1c9c29edbb339c6ee</a>
<b>INPUT</b>	<p>Sanskar</p> <p>4321</p> <p>M</p> <p>IETE</p> <p>Programme 9</p>

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**OUTPUT  
SCREENSHOTS**

```
C:\Users\Admin\Desktop\Programs\Matrix.exe

Enter employee's basic info:
Enter Name: Sanskar
Enter Emp. Id: 4321
Enter Gender: M
Enter employee's department info:
Enter Department Name: IETE
Enter assigned work: Programmer
Enter time in hours to complete work: 9
Employee's Information is:
Basic Information...:
Name: Sanskar
Employee ID: 4321
Gender: M

Department Information...:
Department Name: IETE
Assigned Work: Programmer
Time to complete work: 9

-----
Process exited after 36.93 seconds with return value 0
Press any key to continue . . .
```