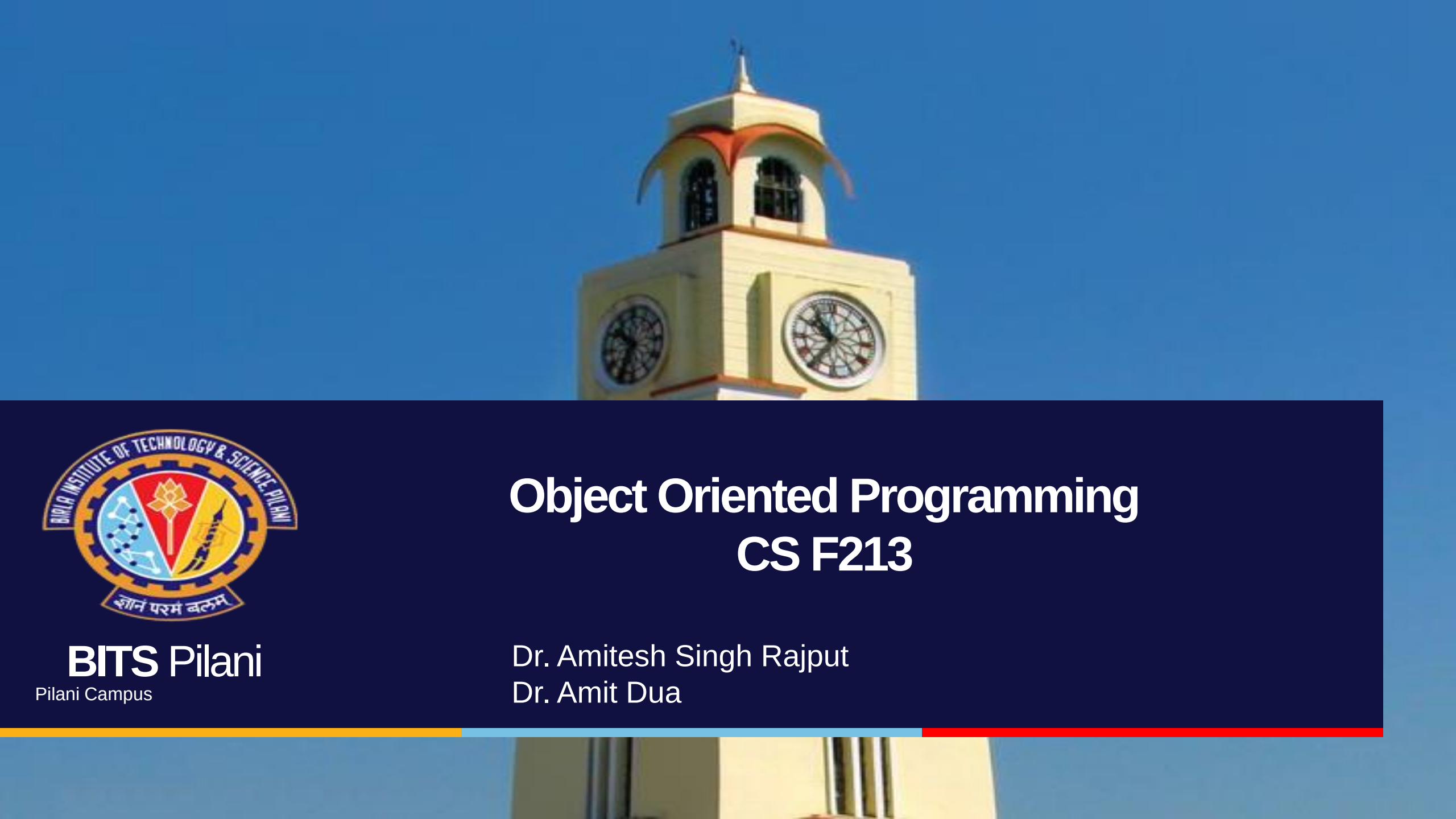

Object Oriented Programming
CS F213

BITS Pilani
Pilani Campus

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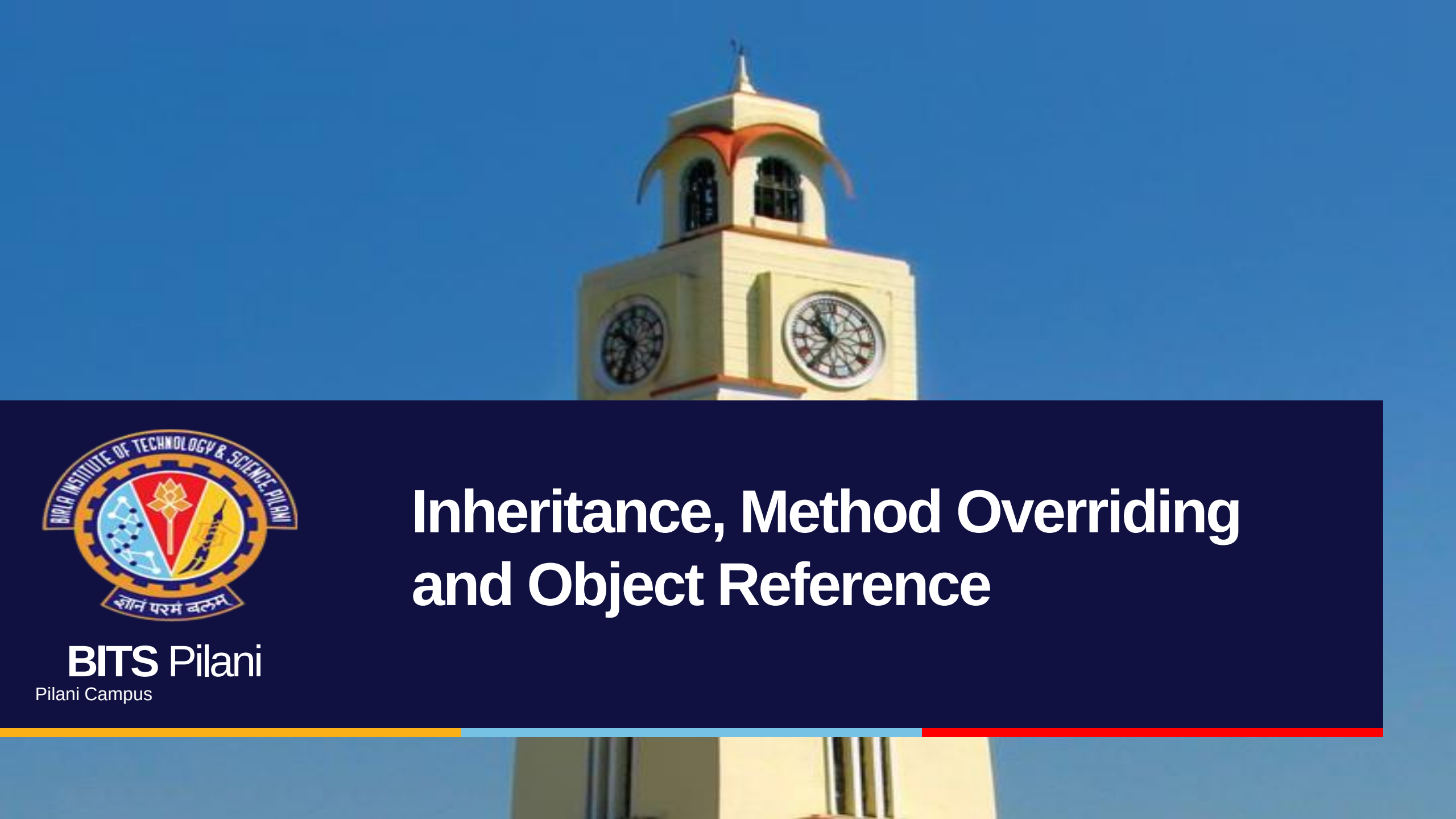

Inheritance, Method Overriding and Object Reference

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Recalling Inheritance

From view of the derived class there are 3 categories of methods in the base class.

1. Constructors:

To call constructors of base class "**super**" keyword is used

```
Syntax: super(<args>);
```

2. Overridden Functions:

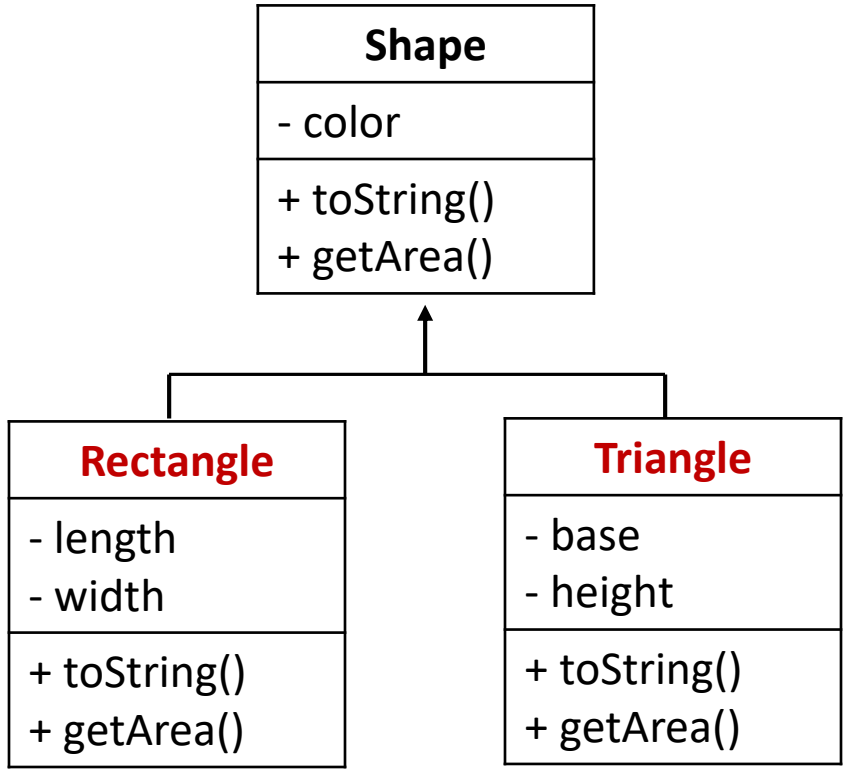
To call overridden functions of base class

```
Syntax: super.functionName(<args>);
```

3. Remaining/Normal Functions:

To call remaining functions

```
Syntax: functionName(<args>);
```



Recalling Inheritance - Example

```
public class Shape {
 String color;

 public Shape (String c) {
  color = c;
 }

 @Override
 public String toString() {
  return "Shape of color=\"" + color + "\"";
 }

 public double getArea() {
  System.err.println("Shape unknown! Cannot compute area!");
  return 0;
 }
}
```

Recalling Inheritance - Example

```
public class Rectangle extends Shape {
 int length, width;

 public Rectangle(String color, int l, int w) {
   super(color);
   length = l;
   width = w;
 }
 @Override
 public String toString() {
  return "Rectangle of length=" + length + " and width=" + width + ", subclass of " + super.toString();
 }
 @Override
 public double getArea() {
  return length*width;
 }
}
```

Recalling Inheritance - Example

```
public class Triangle extends Shape{
 int base, height;
 public Triangle(String color, int b, int h) {
   super(color);
   base = b;
   height = h;
 }

 @Override
 public String toString() {
  return "Triangle of base=" + base + " and height=" + height + ", subclass of " + super.toString();
 }

 @Override
 public double getArea() {
   return 0.5*base*height;
 }
}
```

Recalling Inheritance - Example

```
public class TestShape {
 public static void main(String[] args) {

 Rectangle s1 = new Rectangle("red", 4, 5);
 System.out.println(s1);
 System.out.println("Area is " + s1.getArea());

 Triangle s2 = new Triangle("blue", 7, 8);
 System.out.println(s2);
 System.out.println("Area is " + s2.getArea());
 }
}
```

```
Rectangle of length=4 and width=5, subclass of Shape of color="red"
Area is 20.0

Triangle of base=7 and height=8, subclass of Shape of color="blue"
Area is 28.0
```

Passing Objects to Methods

- Java is strictly pass by value.
- Call by reference can be achieved when objects are passed as arguments.
  - When a variable of class type is created, it implies that a reference to an object is created. E.g: `Account a1;`
  - Reference variable is used to store the address of the object.
  - When the reference is passed to a method, the parameter that receives refer to the same object.

Passing Objects - Example


```
class Account{
   int id; String name; float amount;
   Account(int act, String aname){
        id = act;
        name = aname;
   }
   boolean equalTo(Account a) {
        return(id == a.id && name == a.name);
   }
}
     class TestAccount{
       public static void main(String[] args){
            Account a1 = new Account(832345,"Ankit");
            Account a2 = new Account(832345,"Ankit");
            Account a3 = new Account(832346,"Shobit");
            System.out.println("a1==a2: " + a2.equalTo(a1));
            System.out.println("a1==a3: " + a3.equalTo(a1));
     }}
```

Output:

```
a1 == a2: true
a1 == a3: false
```

Assigning Object Reference Variables

- Value of a reference variable can be assigned to another reference variable.
- Assigning reference will not create distinct copies of objects.
- All reference variables are referring to the same object.

Assigning Object Reference

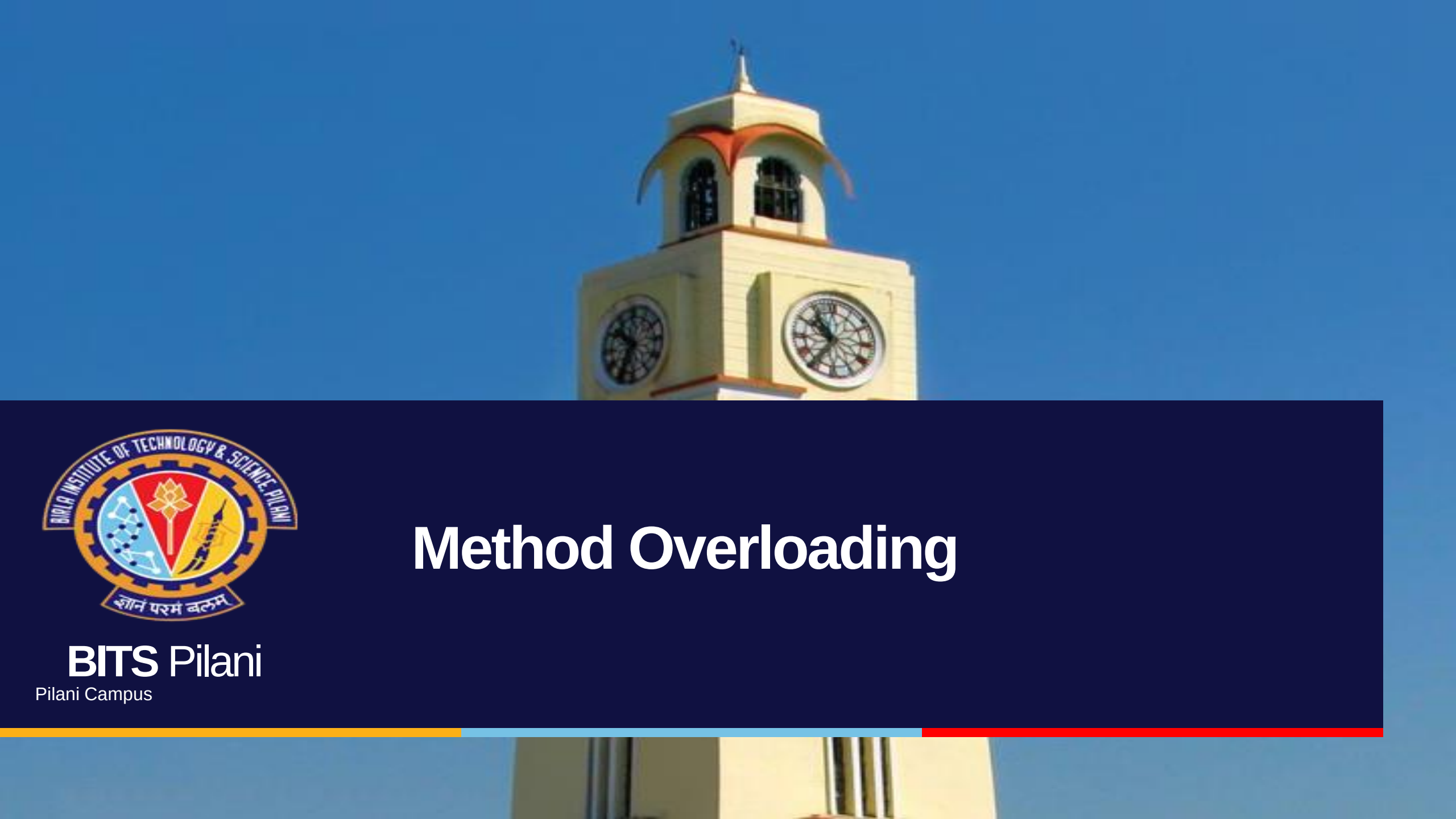

```
class Account{
   int acc;
   String name;
   float amount;
   Account(int act,String aname){
        acc = act;
        name = aname;
   }
   boolean equalTo(Account a) {
        return(acc == a.acc && name == a.name);
   }
   void display(){
        System.out.println(acc+" "+name+" "+amount);}
   }
```

Assigning Object Reference


```
class Second{
   public static void main(String[] args){
   Account a1 = new Account(832345,"Ankit");
   Account a2 = a1;
   Account a3 = new Account(832346,"Shobit");

   System.out.println("a1==a2:" + a2.equalTo(a1));
   System.out.println("a1==a3:" + a3.equalTo(a1));

   a1.name = "Sahni";
   a2.display();

   System.out.println(a1.hashCode());
   System.out.println(a2.hashCode());
   }
}
```

Output:

a1==a2: true
a1==a3: false
832345 Sahni 0.0



Method Overloading

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Different ways to overload

- Changing the number of arguments
  - `int add(int a, int b)`
  - `int add(int a, int b, int c)`
- Changing the data type
  - `int add(int a, int b)`
  - `double add(double a, double b)`
- **Note:** Changing only return type does not mean method overloading
  - `int add(int a,int b)`
  - `double add(int a,int b)`
  - Compile Time Error: method add(int,int) is already defined in class Adder

Method Overloading - Example

```
class Account{
 int acc_no;
 String name;
 float amount;
 void insert(int a, String n, float amt){
   acc_no = a;
   name = n;
   amount = amt;  }
 void insert(int a, String n){
   acc_no = a;
   name = n;
   amount = 1000;  }
 void display(){
   System.out.println(acc_no+" "+name+" "+amount);}
}
```

```
class TestAccount{
  public static void main(String[] args){
      Account a1 =  new Account();
      a1.insert(832345,"Ankit",5000);
      a1.display();

      Account a2 =  new Account();
      a2.insert(832346,“Shobit“);
      a2.display();
  }
}
```

Output:
832345 Ankit 5000.0
832346 Shobit 1000.0

Can Main() be overloaded?


```
public static void main(String[] args){
   System.out.println("main with String[]");
}

public static void main(String args){
   System.out.println("main with String");
}

public static void main(){
   System.out.println("main without args");
}
```

Ans: Yes. But, JVM calls main() method which receives **string array** as arguments only.

What should be printed?


```
class OverloadingCalculation{
  void add(int a, int b){
       System.out.println("int arg method invoked");
  }
  void add(long a, long b){
       System.out.println("long arg method invoked");
  }

  public static void main(String args[]){
       OverloadingCalculation obj = new OverloadingCalculation();
       obj.add(20, 20);
  }
}
```

Output:
int arg method invoked

What should be printed?


```
class OverloadingCalculation{
  void add(int a, long b){
       System.out.println("a method invoked");
  }
  void add(long a, int b){
       System.out.println("b method invoked");
  }

  public static void main(String args[]){
       OverloadingCalculation obj = new OverloadingCalculation();
       obj.add(20, 20);
  }
}
```

Output:
Compile time error

Promotion Ambiguity

Constructor Overloading

- **Recall:** Constructor is just like a method but without return type.
- **Constructor overloading:** Having more than one constructor with different parameter lists.
- The compiler differentiates by the **number of parameters** in the list and their **types**.

Constructor Overloading - Example

```
class Account{
  int acc_no;
  String name;
  float amount;
  Account(int acc, String aname){
   acc_no = acc;
   name = aname;
   amount = 1000;
  }
  Account(int acc, String aname, float amt){
   acc_no = acc;
   name = aname;
   amount = amt;
  }
  void display(){
   System.out.println(acc_no+" "+name+" "+amount);
  }
}
```

```
class TestAccount{
  public static void main(String[] args){
  Account a1=new Account(832345,"Ankit",5000);
  a1.display();
  Account a2=new Account(832346,"Shobit");
  a2.display();
  }
}
```

Output:
832345 Ankit 5000.0
832346 Shobit 1000.0

Passing Objects to Constructors Example


```
class Account{
   int acc;
   String name;
   float amount;
   Account(int act, String aname){
     acc = act;
     name = aname;
   }
   Account(Account a){
     acc = a.acc;
     name = a.name;
   }
   boolean equalTo(Account a) {
     return(acc == a.acc && name == a.name);
   }
   void display(){
     System.out.println(acc+" "+name+" "+amount);}
}
```

```
class TestAccount{
  public static void main(String[] args){
    Account a1 = new Account(832345,"Ankit");
    Account a2 = new Account(a1);
    Account a3 = new Account(832346,"Shobit");
    System.out.println("a1==a2: " + a2.equalTo(a1));
    System.out.println("a1==a3: " + a3.equalTo(a1));
    a1.name = "Sahni";
    a1.display();
    a2.display();
  }
}
```

Output:

a1 == a2: true
a1 == a3: false
832345 Sahni 0.0
832345 Ankit 0.0

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Thank You!