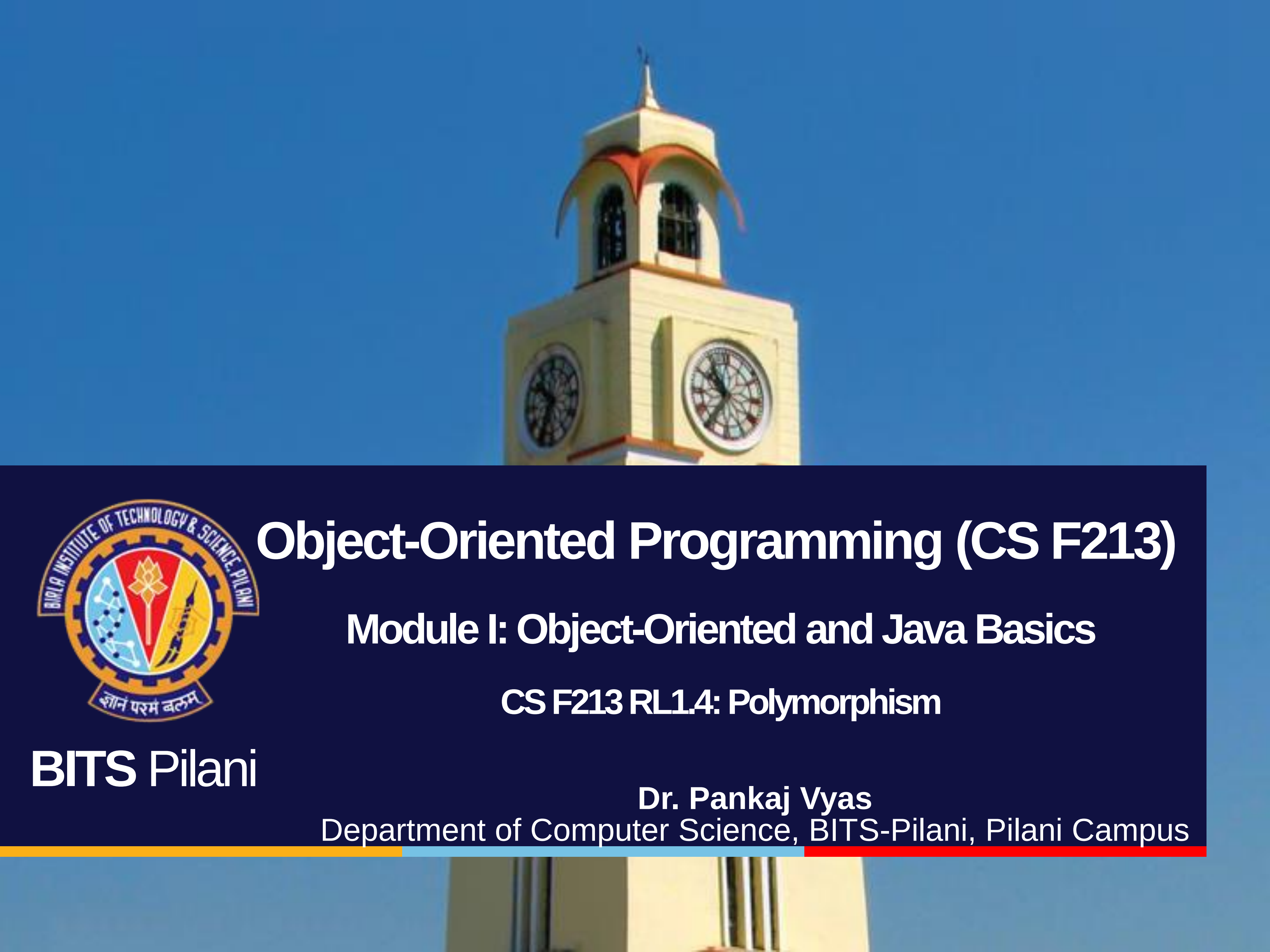

Object-Oriented Programming (CS F213)

Module I: Object-Oriented and Java Basics

CS F213 RL1.4: Polymorphism

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CS F213 RL 1.4 : Topics

- Method Signatures
- Polymorphism
- Polymorphism Types

Method Signatures

- A Method Signature is the method name and the number, type and order of its parameters .
- Return type of a method is not considered to be a part of the method signature.

Methods	Method Signatures
`int doSomeThing(int a , float b) { ………………. }`	doSomeThing(int,float)
`float doSome(int a , int b, int c) { ………………. }`	doSome(int,int,int)

```
int        doSomeThing(int a , float b)
{
           ……………….
}

float      doSome(int a , int b, int c)
{
           ……………….
}
```

Polymorphism

https://en.wikipedia.org/wiki/Polymorphism_(computer_science)

- One Interface Having Multiple Forms
- Three Flavors

1. Adhoc Polymorphism (Via Method Overloading)
2. Subtyping (Via Method Overriding)
3. Parametric Polymorphism (Via Generic Programming –Will be Covered Later)

Adhoc Polymorphism : Method Overloading

- Supported via Method Overloading
- Two Methods are said to be overloaded if they have same name but different signatures
- Method signatures can be different either via having different number of arguments to methods or via having different order of the arguments
- Overloaded method either may have same or different return types

int	add(int a , int b)	{ ….}	→	add(int , int)
float	add(float a, float b)	{ ….}	→	add(float , float)
double	add(double a, double b)	{ ….}	→	add(double , double)
String	add(String a, String b)	{ ….}	→	add(String , String)

Adhoc Polymorphism : Method Overloading

- Method Overloading Example

```
class MethodOverloadingExample
{
          int       doS(int a, float b)           { … }  →  doS(int , float)

          float     doS(float a, int b)           { … }  →  doS(float, int)

          int       doS(int a, float b, int c)    { … }  →  doS(int , float, int)

          float     doS(int a, float b, double c){ … }   →  doS(int , float, double)
}
```

$$\left.\begin{array}{l}\texttt{float doS(double a, float b) \{ … \}} \\ \texttt{double doS(double x, float y) \{ … \}}\end{array}\right\}$$

Wrong Method Declaration in In Same Class→ Compile Time Error (Not Overloaded Methods)

Polymorphism: Subtyping (Via Method Overriding)

- This Type of Polymorphism is known as Runtime Polymorphism (Dynamic Method Dispatch or Method Overriding)
- Two Methods are said to be overridden if and only if they have name, same signatures and same return type
- Exhibited only by sub-classes of a common super class
- A sub class can override a method of a super class

```
class A
{
            public void doS(int a, int b)    { …. }
}// End of class A

class B extends A
{
            public void doS(int a, int b)    { …. }
}// End of class B
```

class B overrides the doS() method of super class A.

Polymorphism: Subtyping (Via Method Overriding)

- Method Overriding Example-1

```
class A
{
        public void print()
        {
                System.out.println("Hello Class A");
        }
}// End of class A

class B extends A
{
        public void print()
        {
                System.out.println("Hello Class B");
        }
}// End of class B
```

```
A  a1 = new A();
a1.print();
```

// What's the o/p?

```
a1 = new B();
a1.print();
```

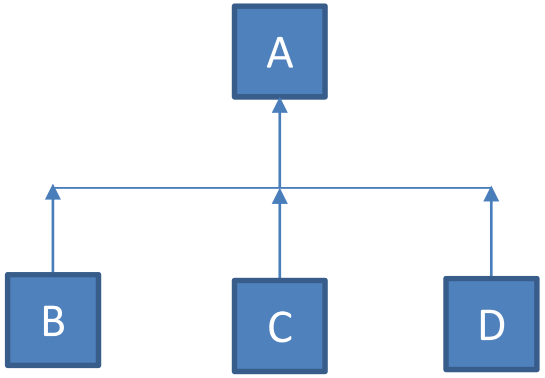
// What's the o/p?

class B overrides the print() method of super class A.

Polymorphism: Subtyping (Via Method Overriding)

- Method Overriding Example-2

```
class A
{
                    public void print()
                    {
                                        System.out.println("Hello Class A");
                    }
}// End of class A
class B extends A
{
                    public void print()
                    {
                                        System.out.println("Hello Class B");
                    }
}// End of class B
class C extends A
{
                    public void print()
                    {
                                        System.out.println("Hello Class C");
                    }
}// End of class C
class D extends A
{
                    public void print()
                    {
                                        System.out.println("Hello Class D");
                    }
}// End of class D
```



Sub-classes B, C and D overrides the print() from the super class A

```
A a1 =  new   A();
a1.print();

a1 = new D();
a1.print();
```

Polymorphism: Subtyping (Via Method Overriding)

- Overridden Methods Cannot Have Different Return Types

```
class A
{
        public int print()
        {
                System.out.println("Hello Class A");
                return 0;
        }
}// End of class A
class B extends A
{
        public void print()
        {
                System.out.println("Hello Class B");
        }
}// End of class B
```

Wrong .. Compile Time Error

Overridden Methods Can Not have Different Return Types

Polymorphism: Subtyping (Via Method Overriding)

- What is the problem with the following code?

```
class A
{
        public int print(int x)
        {
                System.out.println("Hello Class A");
                return 0;
        }
}// End of class A
class B extends A
{
        public void print()
        {
                System.out.println("Hello Class B");
        }
}// End of class B
```

Method Overloading

No Error → Not Method Overriding

Thank You