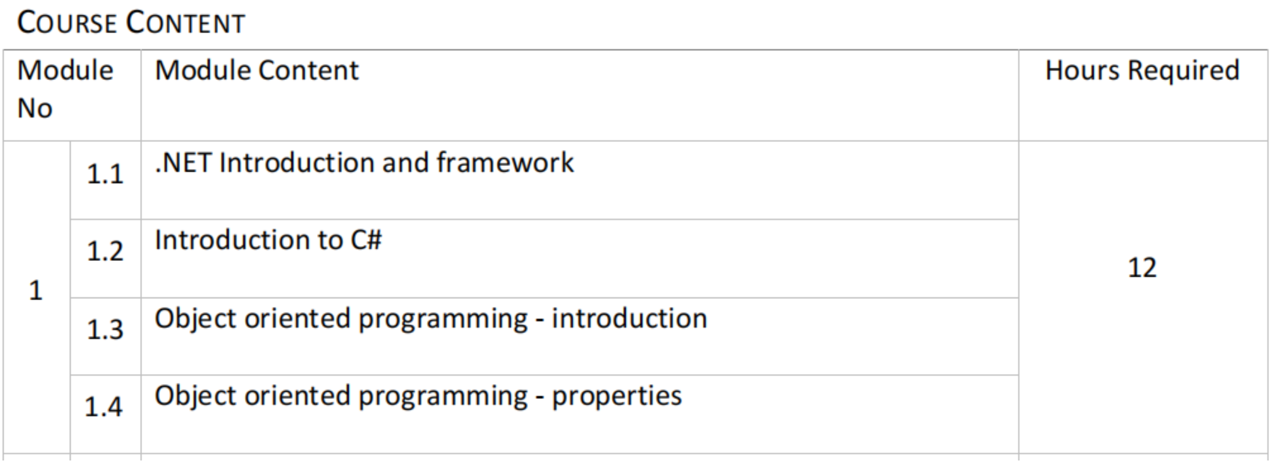
Microsoft .NET Framework using C#



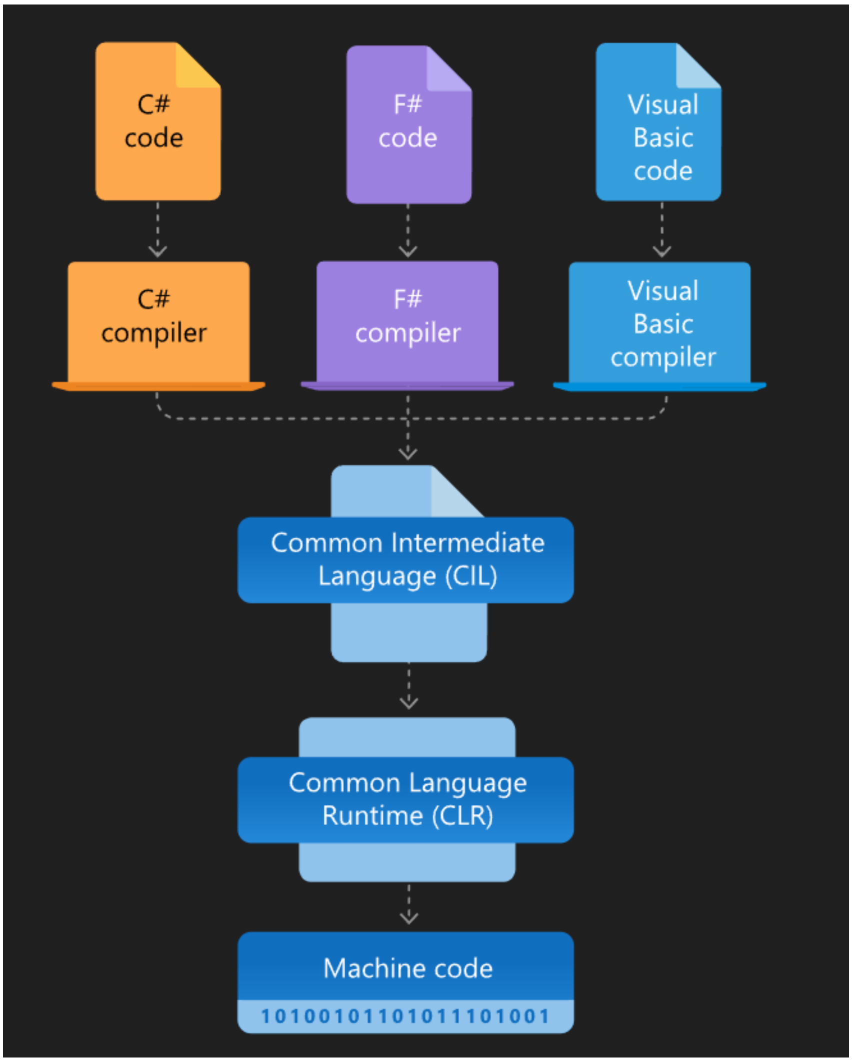
COURSE CONTENT

Module No		Module Content	Hours Required
1	1.1	.NET Introduction and framework	12
	1.2	Introduction to C#	
	1.3	Object oriented programming - introduction	
	1.4	Object oriented programming - properties	

1.1. ***.NET Introduction and framework*** :

- It is a comprehensive software development platform **developed by Microsoft**.
- .NET is a **cross-platform** implementation for running websites, services, and console apps on Windows, Linux, and macOS.
- It is a **virtual machine** that provide a common platform to run an application that was built using the different language such as C#, VB.NET, Visual Basic, etc.
- .NET framework is used for developing and creating applications such as:
  - Console applications
  - Web applications
  - Windows forms applications
  - Web services
  - Event-driven applications.
- The **main objective** of this framework is to develop an application that can run on the windows platform.

KEY Components of .NET Framework:



1) Common Language Runtime (CLR):

Manages the execution of .NET programs, providing services such as memory management, security, and exception handling.

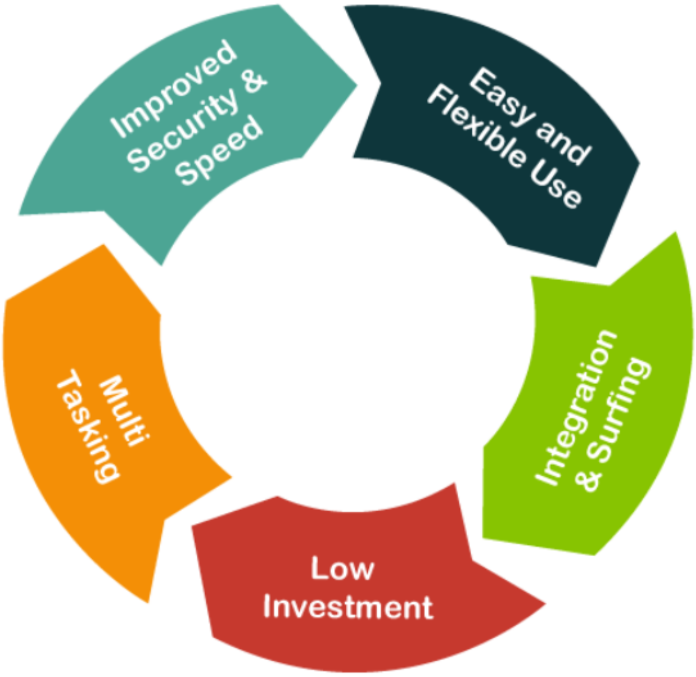
2) .NET Framework Class Library (FCL):

A vast collection of reusable classes, interfaces, and value types. Includes APIs for reading and writing files, connecting to databases, drawing, and more.

KEY Features:

1) **Multiple Language Support.**
2) **Cross-Platform Development.**
3) **Versatile Application Development: (**A vast collection of reusable classes, interfaces, and value types.)

Characteristics



KEY Advantages :

1) **Security :**

Features such as code access security (CAS) and role-based security.

2) **Performance :**

JIT compilation and optimization techniques enhance the speed and efficiency of applications.

3) **Integration :**

Smooth integration with other Microsoft products like SQL Server, SharePoint, and Office.

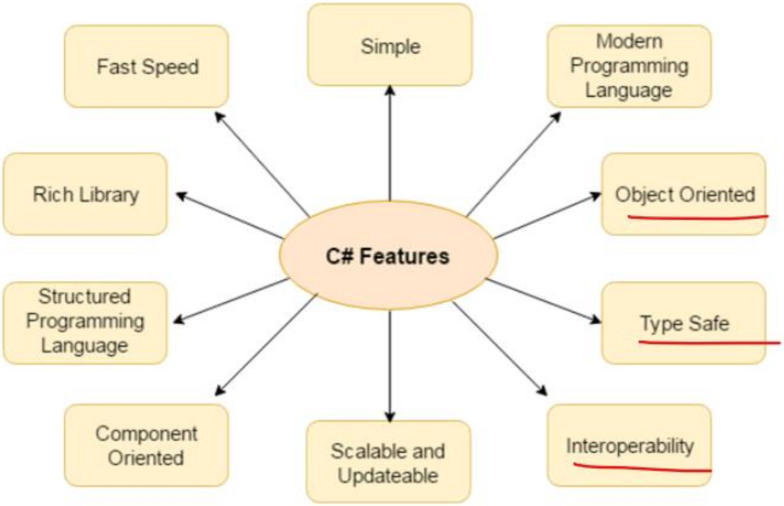
1.2. Introduction to C# :

- C# is an **object-oriented programming language** created by **Microsoft** that runs on the .NET Framework.
- FOUNDER : "**Anders Hejlsberg**".
- It is used to develop **web apps, desktop apps**, **mobile apps**, **games** and much more.

KEY Concepts:

- **Syntax and Structure :** Similar to other C-based languages.
- **Type Safety :** C# enforces strict type checking, reducing bugs and enhancing reliability.
- **Memory Management :** Automatic garbage collection .
- **Language Interoperability:** C# can interoperate with other languages on the .NET platform, thanks to the CLR.

KEY Features:



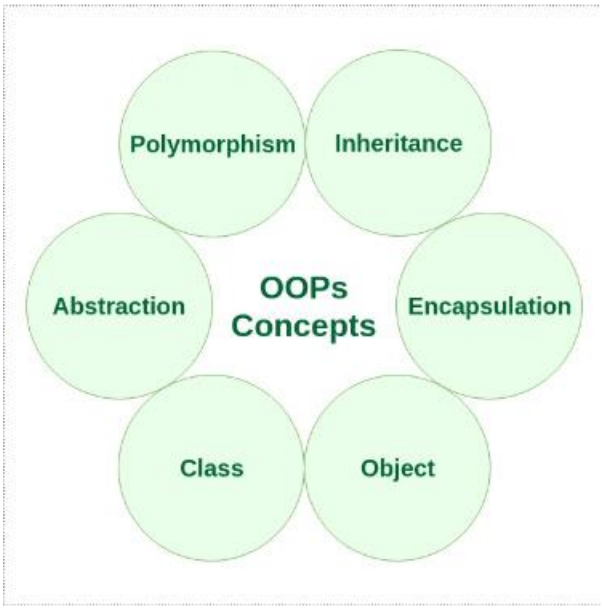
1. **Object Oriented.**
2. **Type Safe:**
   can only access the memory location that it has permission to execute. Therefore it improves a security of the program.
3. **Interoperability.**
4. **Scalable and Updatable.**

1.3. **Object Oriented Programming - Introduction** :

- Object-Oriented Programming (OOP) is a **programming paradigm based on the concept of "objects**," which can contain data and code to manipulate that data. C# is an object-oriented language.

1.4. **Object Oriented Programming - Properties** :

Characteristics:



- **Class : [** is a user-defined data type that has **data members** and **member functions**.**]**
- **Object : [**Instance of a Class**]**
- **Abstraction : [**Displaying only essential information and hiding the details.**]**
- **Inheritance : [**Acquire the properties of parent class into a child class**]**
- **Polymorphism : [**Having many forms.An operation may exhibit different behaviors in different instances.**]**
- **Encapsulation : [**binding together the data and the functions**]**

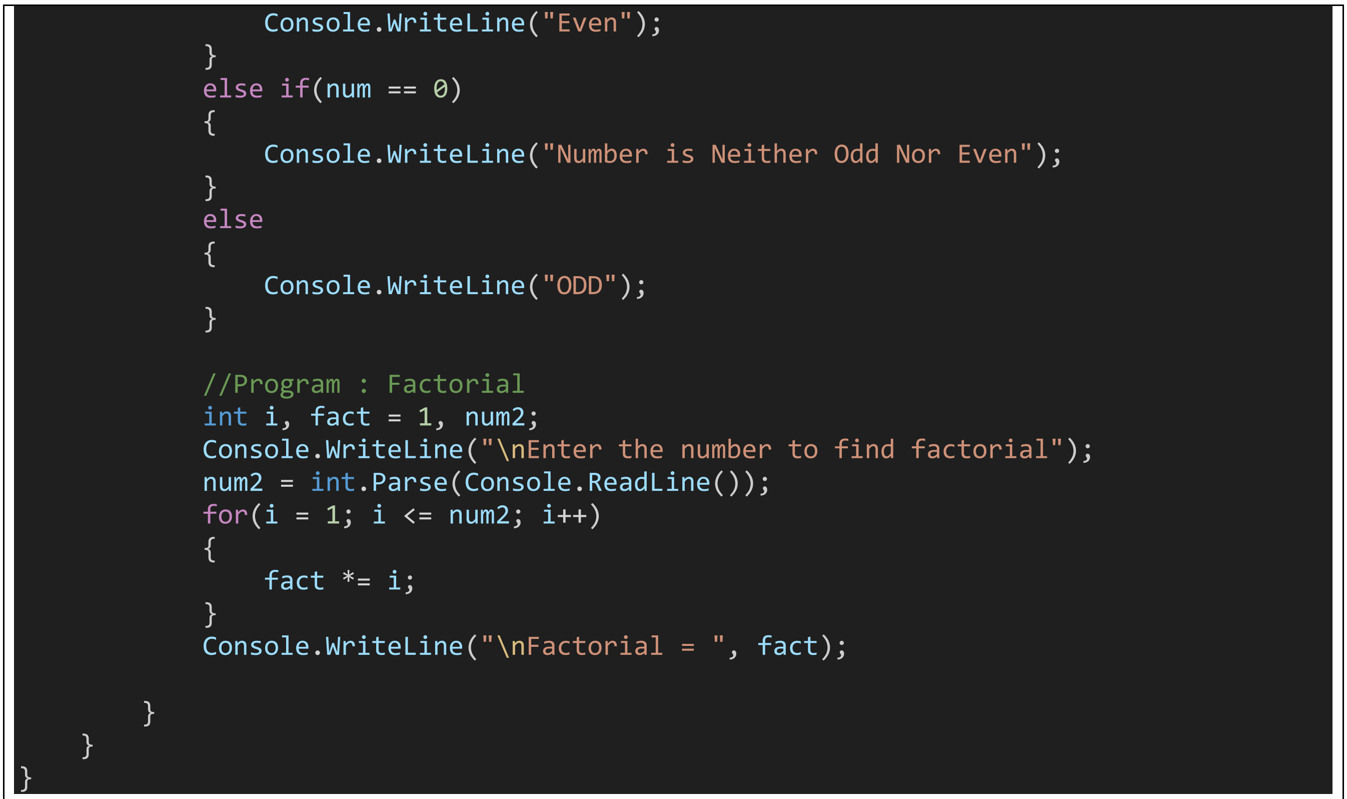
Benefits :

- **Modularity :**
  Code is organized into discrete objects, making it easier to manage and understand.
- **Reusability .**
- **Scalability.**

LAB PROGRAMs :

DAY 1:BASICS

```
namespace sampleproject2
{
    internal class Program
    {
        static void Main(string[] args)
        {
            Console.WriteLine("Hello, World!");
            long myNum = 15000000;
            Console.WriteLine(myNum);
            int myInt = 9;
            double myDouble = myInt;
            Console.WriteLine(myDouble);
            Console.WriteLine(myInt);

            //Automatic casting:Int to Double
            myInt = (int)myDouble;
            Console.WriteLine(myDouble);

            //Program :To display Day
            Console.WriteLine("\nEnter a num b/w 1 to 7 to find the day:" );
            int input = int.Parse(Console.ReadLine());

            switch (input)
            {
                case 1:
                    Console.WriteLine("Monday");
                    break;
                case 2:
                    Console.WriteLine("Tuesday");
                    break;
                case 3:
                    Console.WriteLine("Wednesday");
                    break;
                case 4:
                    Console.WriteLine("Thursday");
                    break;
                case 5:
                    Console.WriteLine("Friday");
                    break;
                case 6:
                    Console.WriteLine("Saturday");
                    break;
                case 7:
                    Console.WriteLine("Sunday");
                    break;
                default:
                    Console.WriteLine("Invalid Input");
                    break;
            }

            //PROGRAM : Odd or Even
            Console.WriteLine("Enter the num to find Odd or Even : ");
            int num = int.Parse(Console.ReadLine());

            if(num%2 == 0)
            {
```



```
                Console.WriteLine("Even");
            }
            else if(num == 0)
            {
                Console.WriteLine("Number is Neither Odd Nor Even");
            }
            else
            {
                Console.WriteLine("ODD");
            }

            //Program : Factorial
            int i, fact = 1, num2;
            Console.WriteLine("\nEnter the number to find factorial");
            num2 = int.Parse(Console.ReadLine());
            for(i = 1; i <= num2; i++)
            {
                fact *= i;
            }
            Console.WriteLine("\nFactorial = ", fact);

        }
    }
}
```

DAY 2: Exercise 1

Extend the Mobile class and create an Android class that implements multiple interfaces. Create two interfaces:

- **ICamera**: With a method **TakePhoto()**.
- **IGPS**: With a method **GetLocation()**.

The Android class should implement these interfaces in addition to inheriting from the Mobile class.

After creating the Android class, write a program to:

1. Create an instance of the Android class.
2. Set the attributes brand, model, and osVersion.
3. Call the **ChargeBattery** method to set the battery level to 75%.
4. Call the **MakeCall** method to simulate making a call.
5. Call the **TakePhoto** method to simulate taking a photo.
6. Call the **GetLocation** method to simulate getting the current location.
7. Print the details of the Android device using a method.

File : "Mobile.cs"

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;

namespace ProjectMobile
{
    public class Mobile
    {
        //Attributes :
        public string brand;
        public string model;
        public int battery_level;

        //Constructor
        public Mobile(string brand, string model)
        {
            this.brand = brand;
            this.model = model;
            this.battery_level = 0; //Setting intial battery_level a 0%

        }

        //Method to simulate making a call :
        public void makeCall(string phoneNumber)
        {
            Console.WriteLine(phoneNumber);
            Console.WriteLine("\nMaking a Call.....");
            useBattery(10); //10% Battery is consumed when making a call
        }
        public void chargeBattery(int amount) {
            battery_level += amount;
            if (battery_level > 100) {
                battery_level = 100;
            }
            Console.WriteLine($"Battery charged to {battery_level}%");
        }
        public void useBattery(int amount)
        {
            battery_level -= amount;
            if (battery_level < 0) {
                battery_level = 0;
            }
            Console.WriteLine($"Battery level is now {battery_level}%");
        }

        //method to print mobile details
        public void printDetails()
        {
            Console.WriteLine($"Brand : {brand}");
            Console.WriteLine($"Model: {model}");
            Console.WriteLine($"Battery Level : {battery_level}%");
        }
    }

}
```

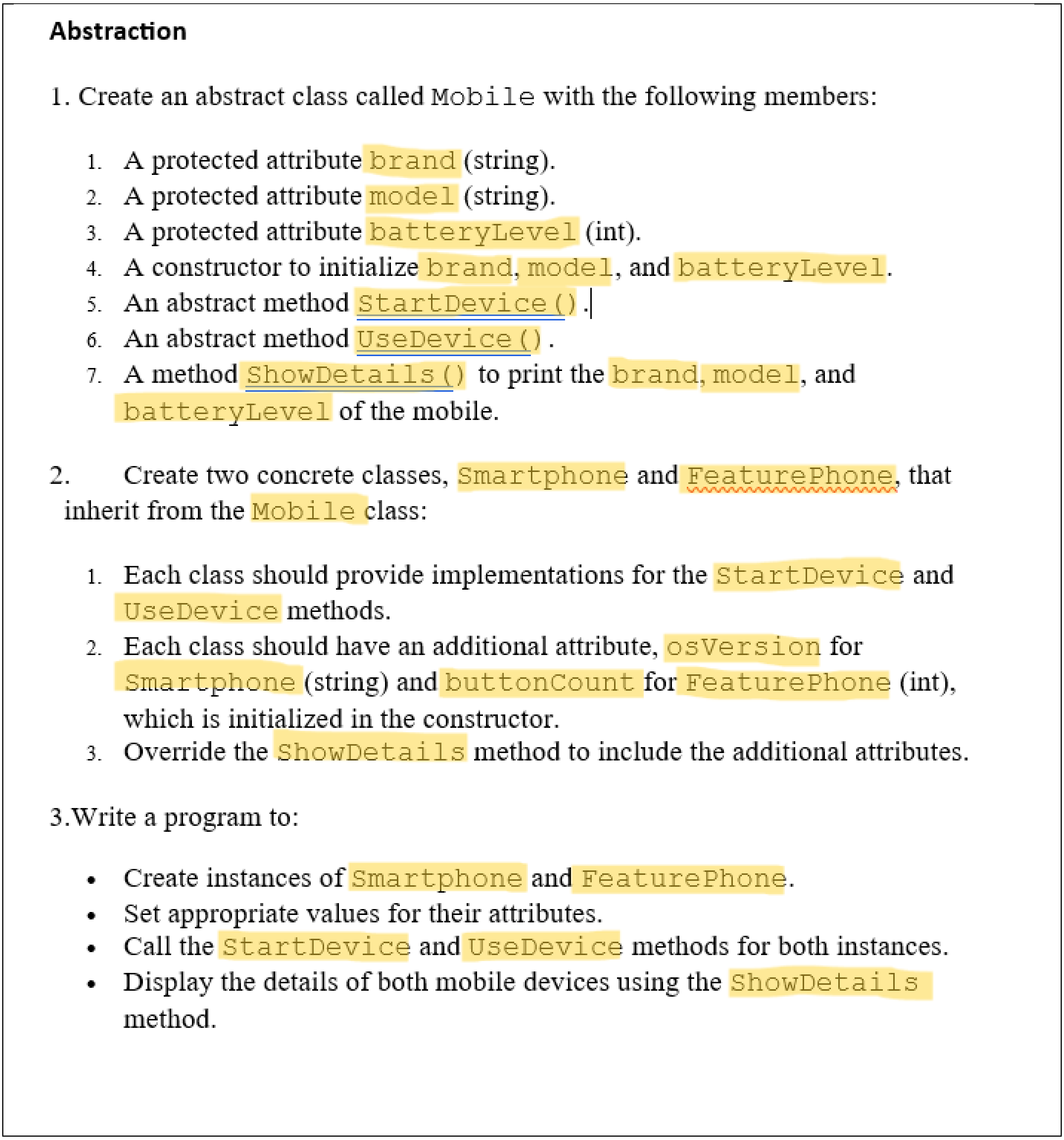
File : “Android.cs”

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;

namespace ProjectMobile
{
    interface ICamera
    {
        void TakePhoto();
    }
    interface IGps
    {
        void GetLocation();
    }
    public class Android : Mobile, ICamera, IGps
    {
        public void TakePhoto()
        {
            Console.WriteLine("Pic ");
        }
        public void GetLocation()
        {
            Console.WriteLine("Get loc");
        }
        public Android(string brand,string model) : base(brand, model)
        {
        }
        public void installApp(string appName)
        {
            if (battery_level > 20) {
                Console.WriteLine($"Installing {appName} app....");
                useBattery(5);
            }
            else
            {
                Console.WriteLine("Battery is not suffiecient to Install an App.Please
charge your phone ");
            }
        }
    }
}
```

File : “Program.cs”

```
namespace ProjectMobile
{
    internal class Program
    {
        static void Main(string[] args)
        {

            Mobile myPhone = new Mobile("Apple", "Iphone 15");
            myPhone.chargeBattery(50);
            myPhone.makeCall("8157847663");
            myPhone.useBattery(20);
            myPhone.printDetails();

            Android android1 = new Android("Samsung", "S21 FE");
            android1.chargeBattery(50);
            android1.makeCall("6238000260");
            android1.useBattery(10);
            android1.printDetails();
            android1.installApp("Valorant");
            android1.GetLocation();
            android1.TakePhoto();

        }
    }
}
```

DAY 3: Exercise 2(Abstraction)



Abstraction

1. Create an abstract class called Mobile with the following members:

   1. A protected attribute brand (string).
   2. A protected attribute model (string).
   3. A protected attribute batteryLevel (int).
   4. A constructor to initialize brand, model, and batteryLevel.
   5. An abstract method StartDevice().
   6. An abstract method UseDevice().
   7. A method ShowDetails() to print the brand, model, and batteryLevel of the mobile.

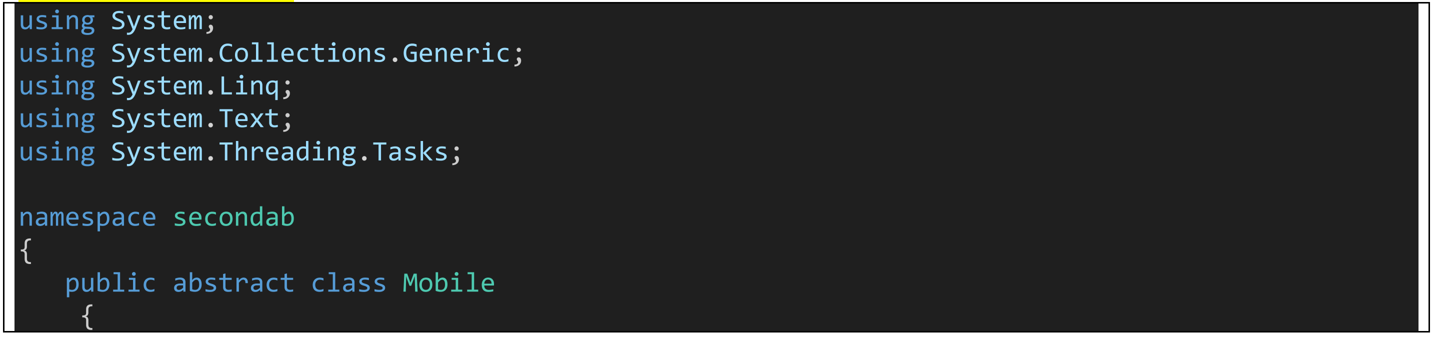
2. Create two concrete classes, Smartphone and FeaturePhone, that inherit from the Mobile class:

   1. Each class should provide implementations for the StartDevice and UseDevice methods.
   2. Each class should have an additional attribute, osVersion for Smartphone (string) and buttonCount for FeaturePhone (int), which is initialized in the constructor.
   3. Override the ShowDetails method to include the additional attributes.

3.Write a program to:

- Create instances of Smartphone and FeaturePhone.
- Set appropriate values for their attributes.
- Call the StartDevice and UseDevice methods for both instances.
- Display the details of both mobile devices using the ShowDetails method.

File : “Mobile.cs”

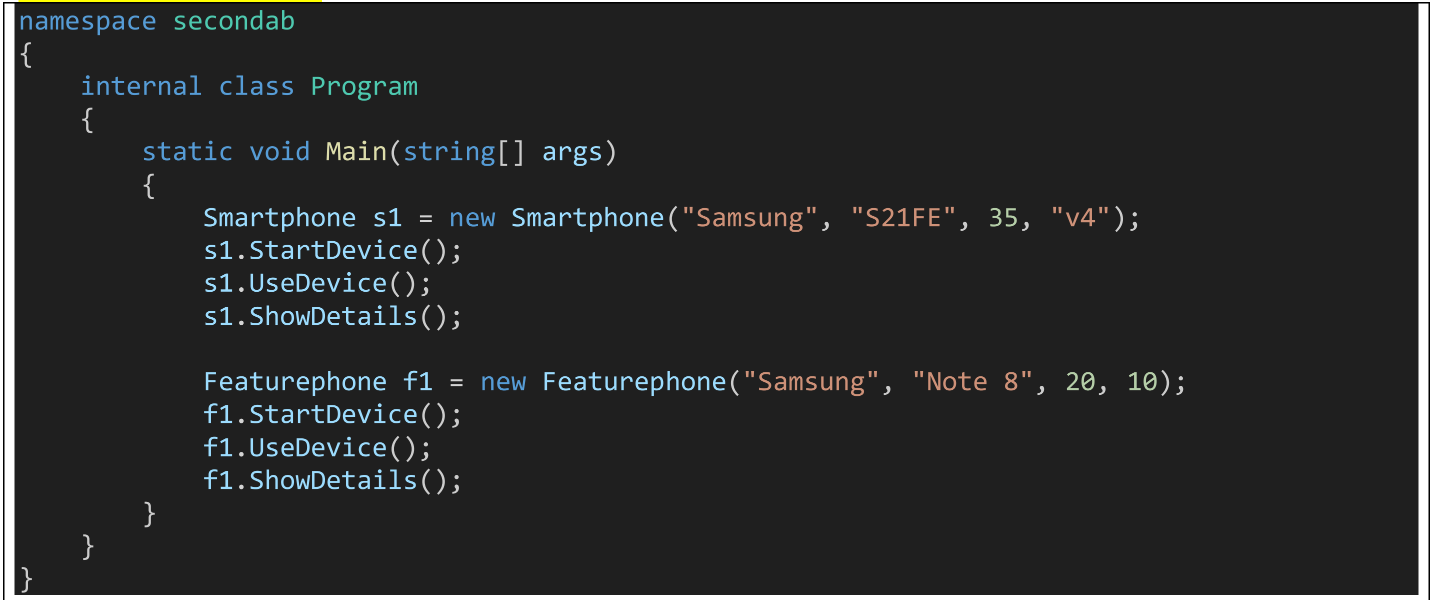


```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;

namespace secondab
{
   public abstract class Mobile
    {
        protected string brand;
        protected string model;
        protected int battery_level;
        protected Mobile(string brand,string model,int battery_level) {
            this.brand = brand;
            this.model = model;
            this.battery_level = battery_level;
        }
        public abstract void StartDevice();
        public abstract void   UseDevice();
        public void ShowDetails()
        {
            Console.WriteLine($"Brand : {brand}");
            Console.WriteLine($"Model: {model}");
            Console.WriteLine($"Battery Level : {battery_level}%");
        }
    }
}
```

File : “Featurephone.cs”

```
using Microsoft.VisualBasic;
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;

namespace secondab
{
    public class Featurephone : Mobile
    {
        int buttonCount;
        public Featurephone(string brand, string model, int battery_level, int 
buttonCount) : base(brand, model, battery_level)
        {
            this.buttonCount = buttonCount;
        }
        public override void StartDevice()
        {
            Console.WriteLine("featurephone device start");
        }
        public override void UseDevice()
        {
            Console.WriteLine(" featurephone use device");
        }
        public void ShowDetails()
        {
            base.ShowDetails();
            Console.WriteLine($"Button count:{buttonCount}");
        }
    }
}
```

File : “Program.cs”



```
namespace secondab
{
    internal class Program
    {
        static void Main(string[] args)
        {
            Smartphone s1 = new Smartphone("Samsung", "S21FE", 35, "v4");
            s1.StartDevice();
            s1.UseDevice();
            s1.ShowDetails();

            Featurephone f1 = new Featurephone("Samsung", "Note 8", 20, 10);
            f1.StartDevice();
            f1.UseDevice();
            f1.ShowDetails();
        }
    }
}
```

DAY 3: Property(using get and set) and Enum

[Note: I have included both Property and Enum’s code together in one program.]

- **private** variables can only be accessed within the same class.
- However, sometimes we need to access them - and it can be done with **properties**.
- A property is like a **combination of a variable and a method**, and it has two methods: a **get** and a **set** method:

File : “Person.cs”

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;

namespace property_get_set
{
    public class Person
    {
        private string name; //field
        public string Name
        { //Property
            get { return name; }
            set { name = value; }
        }
    }
}
```

File : “Program.cs”

```
using System.Security.Cryptography.X509Certificates;

namespace property_get_set
{
    public class Program
    {
        //ENUM:enum is a special "class" that represents a group of constants
        private enum Gender //enum
        {
            Male,
            Female,
            Others
        }
        static void Main(string[] args)
        {
            //GET SET property Part :
            Person pobj1 = new Person();
            pobj1.Name = "Anshad";
            Console.WriteLine($"Name : {pobj1.Name}");

            //ENUM part
            Gender p1 = Gender.Male;
            Console.WriteLine($"Gender of p1 is {p1}");
            Gender p2 = Gender.Female;
            Console.WriteLine($"Gender of p2 is {p2}");

        }
    }
}
```

DAY 4: Delegates

- Delegate is a ***reference to the method***.
- It works like *function pointer* in C and C++.

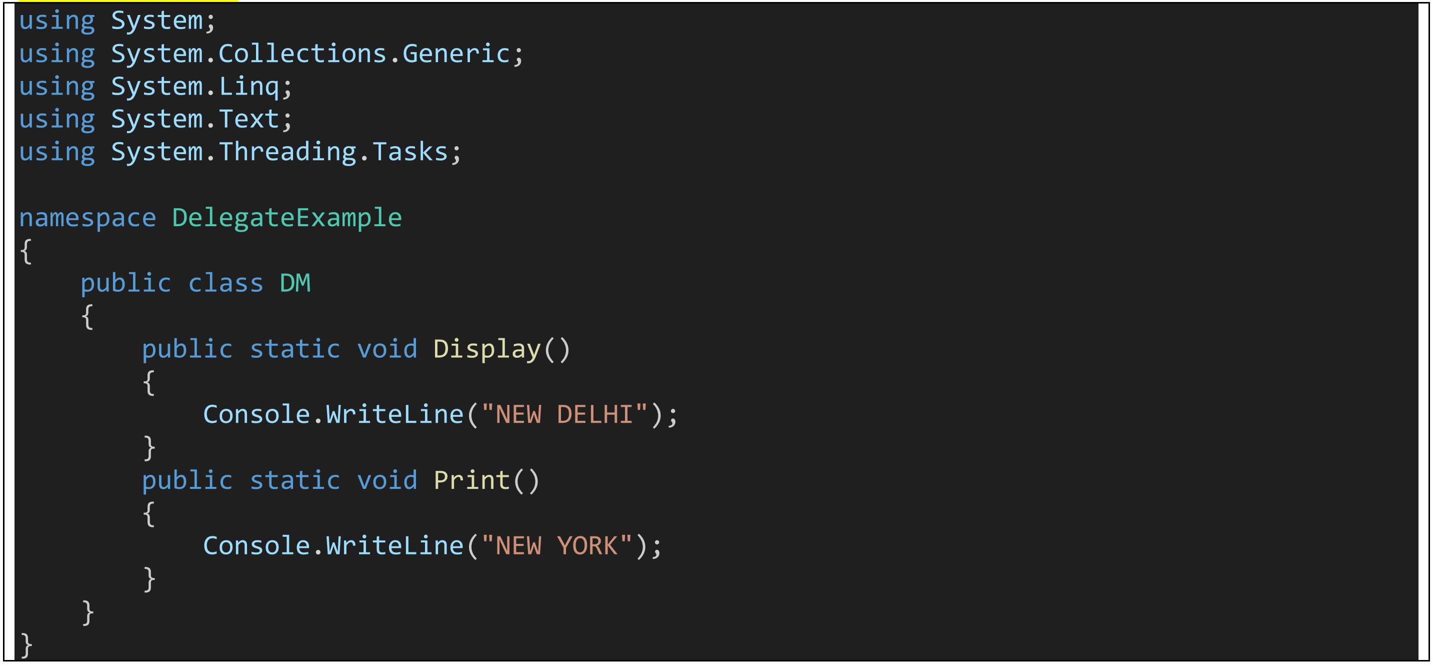
File : “Program.cs”

```
namespace DelegateExample
{
    //Delegate Declaration:
    delegate int ArithOp(int x, int y);
    delegate void MDelegate();

    public class Program
    {
        static void Main(string[] args)
        {
            //Delegate instances:
            ArithOp operation1 = new ArithOp(MathOperation.Add);
            ArithOp operation2 = new ArithOp(MathOperation.Sub);
            //Invoking delegates:
            int result1 = operation1(200, 100);
            int result2 = operation2(200, 100);
            Console.WriteLine("Result 1 = " + result1);
            Console.WriteLine("Result 2 = " + result2);
            //Multicast Delegate :-
            MDelegate m1 = new  MDelegate(DM.Display);
            MDelegate m2 = new MDelegate(DM.Print);
            MDelegate m3 = m1 + m2;
            MDelegate m4 = m2 + m1;
            MDelegate m5 = m3 - m2;
            m3();
            m4();
            m5();
        }
    }
}
```

File : “MathOperation.cs”

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;

namespace DelegateExample
{
    public class MathOperation
    {
        //Delegate Method definition:
        public static int Add(int a, int b)
        {
            return (a + b);
        }
        public static int Sub(int a, int b)
        {
            return (a - b);
        }
    }
}
```

File : “DM.cs”



```csharp
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;

namespace DelegateExample
{
    public class DM
    {
        public static void Display()
        {
            Console.WriteLine("NEW DELHI");
        }
        public static void Print()
        {
            Console.WriteLine("NEW YORK");
        }
    }
}
```

Partial Class

- It allows us to write partial **class, interface, struct and method** in two or more separate source files. **All parts are combined** when the application is compiled.

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Runtime.Intrinsics.X86;
using System.Text;
using System.Threading.Tasks;
namespace PartialClass
{
    public partial class Books
    {
        public string Author_name;
        public string bookno;
        public void printDetails()
        {
            Console.WriteLine($"Author Name : {Author_name} \n Book number : {bookno}");
        }
    }
    public partial class Books
    {
        public string Bookname;
        public string publishername;
        public void PrintPublisherDetails(string bn,string pn)
        {
            this.Bookname = bn;
            this.publishername = pn;
            Console.WriteLine($"Book name : {Bookname} \n Publisher Name : 
{publishername}");
        }
    }
    public partial class Books
    {
        public static void Main(string[] args)
        {
            Books b1 = new Books();
            Console.WriteLine("Enter the Author name");
            b1.Author_name = Console.ReadLine();
            Console.WriteLine("Enter the Book no");
            b1.bookno = Console.ReadLine();
            b1.printDetails();
            Books b2 = new Books();
            b2.PrintPublisherDetails("Dilsha", "a002");
            //Console.WriteLine($"{Author_name} \n {bookno}");
        }
    }
}
```

2	2.1	Advanced .NET	12
	2.2	Multithreaded Programming	
	2.3	Data Base Connectivity- ADO.NET Architecture	
	2.4	Understanding the Data View Object, Working with System.Data.OleDb	

2.1. <u>**Advanced .NET**</u> :

String Handling

- String is an object of “System.string”.

Methods

- **Clone() :**
- **Compare(String,String)**

Exception Handling(try,catch,finally,throw)

Exception Classess:

System.IO.IOEXCEPTION
System.IndexOutOfRangeException
System.ArrayTypeMismatchException
System.DivideByZeroException