Vijay Tutor

C#

Advanced Object-Oriented Programming

Course Syllabus

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What you will learn in this course ?

Duration: 4 Weeks (20 Days total)

Pre-requisites: (Basic C# course should be completed)

Required C# knowledge (syntax, loops, methods, arrays, collections)

Goal:

By the end of this course, students will be able to:

- Apply all four pillars of **OOP effectively** in C#
- **Use** interfaces, abstract classes, generics, delegates, and events **confidently**
- Design modular, reusable systems using **SOLID** principles
- Implement common design patterns and complete **a small OOP-based project**

Week 1 – Core OOP Foundations in C#

Day 1:

- Introduction to OOP in C#
- Classes, Objects, and Members
- Access Modifiers

Day 2:

- Encapsulation
- Properties, Getters/Setters
- `this` keyword

Day 3:

- Abstraction and Abstract Classes
- Abstract vs Concrete Classes

Day 4:

- Interfaces
- Multiple Inheritance via Interfaces
- Interface vs Abstract Class

Day 5:

- Mini Project 1: “Shape Drawer”
- demonstrate polymorphism using abstract classes and interfaces

Week 2 – Inheritance, Polymorphism, and Advanced OOP

Day 6:

- Inheritance Basics
- Base and Derived Classes
- `virtual`, `override`, and `new` keywords concepts

Day 7:

- Polymorphism (Compile-time vs Runtime)
- Casting and as/is operators

Day 8:

- Composition vs Inheritance
- Aggregation and Delegation

Day 9:

- Partial & Nested Classes
- Object Lifetime and Garbage Collection Basics

Day 10:

- Mini Project 2: "Employee Management System"
- using inheritance and polymorphism

Week 3 – Advanced Features: Generics, Delegates, and Events

Day 11:

- Introduction to Generics
- Generic Classes and Methods
- Type Constraints

Day 12:

- Generic Collections (List<T>, Dictionary<TKey,TValue>)
- Custom Generic Methods

Day 13:

- Delegates and Multicast Delegates
- Anonymous Methods and Lambda Expressions

Day 14:

- Events and Event Handling
- EventHandler and EventArgs pattern

Day 15:

- Mini Project 3: “Banking App”
- Using Generics + Delegates + Events

Week 4 – SOLID Principles, Design Patterns & Capstone Project

Day 16:

- SOLID Principles Overview
- Single Responsibility & Open/Closed
- Refactor previous mini-project for SRP and OCP

Day 17:

- Liskov, Interface Segregation, Dependency Inversion
- Implement DIP via constructor injection

Day 18:

- Common Design Patterns – Singleton, Factory, Strategy

Day 19:

- Observer, Repository, and Dependency Injection patterns
- Implement Observer for event notifications

Day 20:

- Final Project: "E-Commerce Order Management System"
- Apply OOP + SOLID + Design Patterns
- Presentation & Code Review