

C# Programming (03 Months)

Syllabus

01: Introduction to C# and .NET Framework

- ✓ What is C#?
- ✓ History and evolution of C#
- ✓ Introduction to the .NET platform and CLR
- ✓ Common Language Runtime (CLR), CTS, and CLS
- ✓ Setting up the development environment (Visual Studio/Vs Code)
- ✓ Writing, compiling, and executing a C# program
- ✓ Structure of a C# program
- ✓ Namespaces and assemblies

02: Basic C# Syntax and Data Types

- ✓ Variables and constants
- ✓ Data types (value types, reference types)
- ✓ Type conversion and casting
- ✓ Operators:
 - Arithmetic
 - Relational
 - Logical
 - Bitwise
 - Assignment
 - Conditional
- ✓ Operator precedence and associativity

03: Control Structures

- ✓ Decision-making statements:
 - if, if-else, switch-case
- ✓ Looping constructs:
 - for, while, do-while, foreach
- ✓ Jump statements: break, continue, goto
- ✓ Nested conditions and loops

04: Methods and Parameters

- ✓ Defining and calling methods
- ✓ Method overloading
- ✓ Parameter passing: by value, by reference (ref, out)
- ✓ Optional and named parameters
- ✓ Recursion
- ✓ Understanding method scope and accessibility

05: Object-Oriented Programming in C#

- ✓ Classes and objects
- ✓ Access modifiers: public, private, protected, internal
- ✓ Fields, properties, and auto-implemented properties
- ✓ Constructors (default, parameterized, static)
- ✓ this keyword
- ✓ Static members
- ✓ Destructors and memory cleanup
- ✓ Object initializers

06: Inheritance and Polymorphism

- ✓ Inheritance and types
- ✓ Base and derived classes
- ✓ Method overriding and hiding
- ✓ Sealed classes and methods
- ✓ Virtual and abstract methods
- ✓ Interfaces and interface inheritance
- ✓ Polymorphism: compile-time vs run-time

07: Structs, Enums, and Tuples

- ✓ Defining and using structs
- ✓ Differences between classes and structs
- ✓ Enums and their use cases
- ✓ Tuples and deconstruction
- ✓ Nullable types and null-coalescing operator

08: Collections and Generics

- ✓ Arrays and array operations
- ✓ List<T>, Dictionary<TKey,TValue>, HashSet<T>, Queue<T>, Stack<T>
- ✓ foreach loop and iterators
- ✓ Generics and type safety
- ✓ Generic classes and methods
- ✓ Constraints on generics

09: Exception Handling

- ✓ Understanding exceptions
- ✓ try, catch, finally blocks
- ✓ Using throw and custom exceptions
- ✓ Handling multiple exceptions
- ✓ System-defined exception classes
- ✓ Best practices for error handling

10: File Handling and Streams

- ✓ Working with the System.IO namespace
- ✓ Reading and writing to text and binary files
- ✓ Using StreamReader, StreamWriter, FileStream, and BinaryReader/BinaryWriter
- ✓ Directory and file operations
- ✓ Exception handling in file I/O
- ✓ File and folder manipulation

11: Delegates, Events, and Lambda Expressions

- ✓ What are delegates and multicast delegates
- ✓ Anonymous methods
- ✓ Events and event handling
- ✓ EventHandler and EventArgs
- ✓ Lambda expressions and functional programming
- ✓ Action, Func, Predicate delegates

Module 12: LINQ (Language Integrated Query)

- ✓ Introduction to LINQ
- ✓ LINQ to Objects, Collections
- ✓ LINQ queries: syntax and method chaining
- ✓ Filtering, ordering, grouping, joining
- ✓ Using Select, Where, First, Any, All, Count, Sum, Average, etc.
- ✓ Working with anonymous types and lambda expressions

Module 13: Working with Databases using ADO.NET

- ✓ Introduction to ADO.NET
- ✓ Connecting to SQL Server or MySQL
- ✓ Executing SQL commands (SELECT, INSERT, UPDATE, DELETE)
- ✓ Working with SqlConnection, SqlCommand, SqlDataReader, SqlDataAdapter, DataSet
- ✓ Parameterized queries
- ✓ Using stored procedures with C#
- ✓ Exception handling with database operations

14: Windows Forms Application (WinForms)

- ✓ Introduction to Windows desktop development
- ✓ Designing forms and GUI components
- ✓ Event-driven programming
- ✓ Working with controls: buttons, textboxes, labels, combo boxes, list views
- ✓ Form validation and error handling
- ✓ File dialogs and printing
- ✓ Connecting WinForms with databases

15: Introduction to WPF (Windows Presentation Foundation)

- ✓ WPF architecture and advantages over WinForms
- ✓ XAML syntax and elements
- ✓ Layouts, controls, and events
- ✓ Data binding and MVVM pattern basics
- ✓ Styles, templates, and resources
- ✓ Simple WPF projects

16: Basics of Web Development using ASP.NET Core

- ✓ Introduction to ASP.NET and ASP.NET Core
- ✓ Understanding MVC architecture
- ✓ Creating Razor Pages and Controllers
- ✓ Routing and Middleware
- ✓ Form handling and validation
- ✓ Connecting web apps to a database
- ✓ Building simple web applications

17: Multithreading and Asynchronous Programming

- ✓ Understanding threads and the Thread class
- ✓ Using ThreadPool, Task, and async/await
- ✓ Synchronization: lock, Monitor, Mutex, Semaphore
- ✓ Parallel programming basics
- ✓ Background tasks and thread-safe operations

18: Working with APIs and JSON

- ✓ Calling REST APIs from C#
- ✓ Consuming data from JSON APIs using HttpClient
- ✓ Serializing and deserializing JSON with System.Text.Json and Newtonsoft.Json
- ✓ Creating your own RESTful APIs using ASP.NET Core (Intro level)

19: Deployment and Version Control

- ✓ Creating executable files and installers
- ✓ Publishing C# projects
- ✓ Introduction to Git and GitHub
- ✓ Pushing projects to repositories
- ✓ Collaboration and version tracking

20: Final Projects and Assessments

- ✓ Mini Projects:
 - Student Management System
 - Personal Expense Tracker
 - File Encryption Tool
- ✓ Capstone Project:
 - End-to-end real-world application using C#, WinForms/WPF, and SQL
- ✓ Code reviews, presentations, and documentation