

BASIC LEVEL (FUNDAMENTALS)

MODULE 1: INTRODUCTION TO C# PROGRAMMING

- ✚ What is C#?
- ✚ Setting up (Visual Studio, VS Code, dotnet CLI)
- ✚ First C# Program

MODULE 2: DATA TYPES AND VARIABLES

- ✚ Primitive types (int, double, bool, string)
- ✚ var keyword (type inference)
- ✚ Nullable types (int?)

MODULE 3: OPERATORS & EXPRESSIONS

- ✚ Arithmetic, Logical, Ternary (?:)
- ✚ Null-coalescing (??)
- ✚ null-conditional (?.) operators

MODULE 4: CONTROL FLOW

- ✚ If-else, switch (with pattern matching)
- ✚ Loops (for, foreach, while, do-while)

MODULE 5: METHODS & FUNCTIONS

- ✚ Parameters (default, named, params)
- ✚ Method overloading

MODULE 6: ARRAYS & COLLECTIONS

- ✚ Arrays (int[]), List<T>, Dictionary<K,V>
- ✚ Iteration with foreach

MODULE 7: STRING MANIPULATION

- ✚ String interpolation (\$"Hello {name}")
- ✚ StringBuilder, ToLower(), Substring()

MODULE 8: CLASSES & OBJECTS

- ✚ Constructors, Properties (get/set)
- ✚ Static classes/members
- ✚ Abstract classes vs interfaces

MODULE 9: EXCEPTION HANDLING

- ✚ Try-catch-finally
- ✚ Custom exceptions

MODULE 10: GENERICS

- ✚ Generic classes/methods
- ✚ Constraints

MODULE 11: OBJECT-ORIENTED PROGRAMMING

- ✚ Inheritance (: base)
- ✚ Polymorphism (virtual, override)
- ✚ Interfaces (IEnumerable, IDisposable)

MODULE 11: DELEGATES & EVENTS

- ✚ Action, Func, Predicate delegates
- ✚ Event handling (event keyword)

MODULE 11: FILE I/O

- ✚ System.IO, JSON/XML serialization

ADVANCED LEVEL (EXPERT)

MODULE 1: LINQ (LANGUAGE INTEGRATED QUERY)

- ✚ Query syntax vs method syntax
- ✚ Where(), Select(), GroupBy()
- ✚ LINQ to Objects/SQL/XML

MODULE 2: ASYNCHRONOUS PROGRAMMING

- ✚ Async/await
- ✚ Task, Task<T>, Value Task
- ✚ Parallel programming

MODULE 3: UNIT TESTING

- ✚ xUnit/NUnit
- ✚ Mocking (Moq)

MODULE 4: PERFORMANCE OPTIMIZATION

- ✚ Benchmarking (Benchmark DotNet)
- ✚ Memory management (Span<T>, MemoryPool)

MODULE 4: DEPENDENCY INJECTION

- ✚ .NET Core DI Container
- ✚ Constructor injection, IServiceProvider

MODULE 4: ENTITY FRAMEWORK CORE

- ✚ Code-First vs Database-First
- ✚ Migrations, DbContext

MODULE 4: ASP.NET CORE (WEB DEV)

- ✚ MVC Pattern, Razor Pages
- ✚ Web API (RESTful services)

MODULE 4: DESIGN PATTERNS

- ✚ Repository, Singleton, Factory
- ✚ CQRS, Mediator

MODULE 4: SECURITY

- ✚ Authentication (JWT, OAuth)
- ✚ Secure Coding Practices