# **Guide2Code - C# Programming Roadmap**

#### ♦ Phase I: Beginner Level

#### Topics to Learn:

- I. Introduction to C# (Installation, .NET Framework, Visual Studio)
- 2. Basic Syntax & Structure (Main method, Data Types, Variables)
- 3. Operators (Arithmetic, Comparison, Logical, Bitwise)
- 4. Control Statements (if-else, switch-case)
- 5. Loops (for, while, do-while, foreach, break, continue)
- 6. Methods (Functions, Parameters, Return Types, Recursion)
- 7. Arrays & Lists (ID, 2D Arrays, Lists, Dictionary)
- 8. Exception Handling (try-catch, finally, throw)
- 9. File Handling (Reading, Writing, Appending Files)
- 10. Basic Debugging (Breakpoints, Watch Window, Console Logging)

## **Beginner Project Ideas:**

- Simple Calculator Perform basic arithmetic operations
- III Student Grade Calculator Input marks and display grades
- Number Guessing Game User guesses a number, program gives hints
- **I Temperature Converter** Convert Celsius ↔ Fahrenheit
- **Age Calculator** Calculate age based on birth year
- **Bank Account System** Basic deposit and withdrawal operations

#### **♦** Phase 2: Intermediate Level

## Topics to Learn:

- 1. Object-Oriented Programming (Classes, Objects, Inheritance, Polymorphism)
- 2. LINQ (Language-Integrated Query) Querying Collections & Databases
- 3. Generics (Generic Classes, Methods, Collections)
- 4. Delegates & Events (Event Handling, Anonymous Methods)

- 5. Multithreading & Asynchronous Programming (Task, async-await)
- 6. Working with APIs (REST API, JSON Handling, HttpClient)
- 7. Entity Framework (Database ORM, CRUD Operations)
- 8. Windows Forms & WPF (Building Desktop Applications)
- 9. Unit Testing (NUnit, xUnit, Test-Driven Development)
- 10. Advanced Exception Handling (Custom Exceptions, Logging)

## Intermediate Project Ideas:

- El Library Management System Store and manage books
- Contact Management System Add, edit, delete contacts
- To-Do List App Task management using C# GUI
- **Bank Management System** Manage user accounts and transactions
- Tic-Tac-Toe Game Playable in the console or GUI
- Web Scraper Extract information from websites using C#

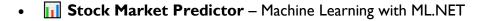
#### ♦ Phase 3: Advanced Level

### Topics to Learn:

- I. ASP.NET Core (MVC, Web API, Dependency Injection)
- 2. Microservices Architecture (Docker, Kubernetes, API Gateway)
- 3. Security in C# (JWT Authentication, OAuth, Data Encryption)
- 4. Blazor Framework (Web App Development)
- 5. Game Development with Unity & C#
- 6. Machine Learning with ML.NET
- 7. Cloud Computing (Azure, AWS Deployment)
- 8. C# Performance Optimization & Profiling
- 9. IoT with C# (Raspberry Pi, Sensor Integration)
- 10. System-Level Programming (Working with Memory, Low-Level Operations)

## Advanced Project Ideas:

- Chat Application Real-time messaging with SignalR
- E-commerce Website Full-fledged shopping platform using ASP.NET



- Secure Login System Authentication using JWT and OAuth
- Face Recognition System Al-based image processing in C#
- 1oT-Based Smart Home System Home automation using C#