**1. Fundamentals of C#**

1. **Introduction to C# and .NET**
   * Overview of C# programming language
   * Introduction to .NET Framework and .NET Core
2. **C# Syntax and Basic Programming Concepts**
   * Variables and data types
   * Operators and expressions
   * Control flow statements (if-else, switch-case)
   * Loops (for, while, do-while, foreach)
3. **Object-Oriented Programming (OOP) Principles**
   * Classes and objects
   * Inheritance
   * Polymorphism
   * Encapsulation
   * Abstraction
4. **Exception Handling**
   * Try-catch blocks
   * Throwing exceptions
   * Custom exceptions
5. **Collections and Generics**
   * Arrays
   * Lists
   * Dictionaries
   * Using generics in collections
6. **LINQ (Language Integrated Query)**
   * Basics of LINQ
   * Query syntax vs. method syntax
   * Common LINQ operations (select, where, orderby, etc.)

**2. Setting Up the Environment**

* Installing Visual Studio or Visual Studio Code
* Setting up .NET Core or .NET Framework
* Creating and managing projects and solutions

**3. Introduction to Testing Frameworks**

* Overview of automated testing
* Introduction to unit testing frameworks: NUnit, MSTest, xUnit
* Writing basic test cases
* Understanding test attributes and annotations

**4. Unit Testing in C#**

* Writing and running unit tests
* Mocking dependencies with Moq or other mocking frameworks
* Code coverage and analysis
* Best practices for unit testing

**5. Integration Testing**

* Differences between unit and integration tests
* Writing integration tests
* Setting up test databases and other dependencies
* Using test doubles and mocks in integration testing

**6. UI Automation Testing**

* Introduction to Selenium WebDriver
* Setting up Selenium in C# projects
* Writing basic Selenium tests
* Locating web elements (XPath, CSS Selectors, etc.)
* Handling dynamic content, iframes, alerts, and windows
* Implementing Page Object Model (POM)
* Best practices for UI automation testing

**7. API Testing**

* Introduction to RESTful services and APIs
* Using RestSharp for API testing in C#
* Writing and running API tests
* Validating JSON responses
* Handling authentication and authorization in API tests

**8. Test Automation Frameworks**

* Designing a test automation framework from scratch
* Introduction to SpecFlow for BDD (Behavior Driven Development)
* Implementing SpecFlow with C#
* Writing Gherkin syntax and step definitions
* Integrating SpecFlow with Selenium and API tests

**9. Continuous Integration and Continuous Deployment (CI/CD)**

* Introduction to CI/CD concepts
* Setting up CI/CD pipelines with Azure DevOps, Jenkins, GitHub Actions, or other tools
* Integrating automated tests into CI/CD pipelines
* Generating test reports and dashboards

**10. Advanced Topics**

* Parallel test execution
* Data-driven testing with external data sources (CSV, Excel, databases)
* Performance and load testing (using tools like JMeter or k6 with C#)
* Security testing basics

**11. Best Practices and Optimization**

* Test case design techniques
* Optimizing test scripts for performance and maintainability
* Version control for test scripts using Git
* Test result analysis and reporting
* Debugging and troubleshooting failed tests

**12. Learning and Improvement**

* Staying updated with the latest trends and tools in test automation
* Participating in forums, communities, and conferences
* Continuous learning through online courses, books, and tutorials