Course Outline

C# Essentials, Rev. 5.0

Course Summary

Description

Microsoft .NET is an advance in programming technology that greatly simplifies application development, both for traditional, proprietary applications and for the emerging paradigm of Web-based services. .NET Framework is the original implementation of .NET, running on Windows. .NET Core is a new package-based implementation that is cross-platform, running on Mac and Linux besides Windows. .NET 5.0 is the next version of .NET Core and is the main implementation of .NET going forward. .NET Framework 4.x continues to be supported.

This two-day course is designed for the experienced programmer to help you quickly come up to speed on the C# language. It is current to Visual Studio 2019, .NET 5.0 and C# 9.0. Important newer features such as dynamic data types, named and optional arguments, tuples, asynchronous programming keywords, nullable reference types, and immutable record types are covered.

This course concisely covers the essentials of programming using Microsoft's C# programming language. It starts with an overview of .NET architecture and the basics of running C# programs in a .NET environment. The next two chapters cover C# language essentials and object-oriented programming in C#. The next chapter discusses how C# relates to the .NET Framework. The following chapter covers delegates and events. The course includes a succinct introduction to creating GUI programs using Windows Forms. The course concludes with a chapter covering the newer features in C#. Appendices provide a tutorial on Visual Studio 2019, an overview of LINQ, and coverage of unsafe code and pointers in C#.

The course is practical, with many example programs and a progressively developed case study. The goal is to quickly bring you up to speed in writing C# programs. The student will receive a comprehensive set of materials, including course notes and all the programming examples.

Objectives

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

- Acquire a working knowledge of C# programming
- Learn about important interactions between C# and the .NET Framework
- Learn how to implement simple GUI programs using Windows Forms
- Gain a working knowledge of important newer features in C#

Topics

- . Introduction to NET
- C# Overview for the Sophisticated Programmer
- Object-Oriented Programming in C#
- C# and the .NET Framework
- Delegates and Events
- Introduction to Windows Forms
- Newer Features in C#
- Appendix A. Using Visual Studio 2019
- Appendix B. Language Integrated Query (LINQ)
- Appendix C. Unsafe Code and Pointers in C#

Audience

This two-day course is designed for the experienced programmer to help you quickly come up to speed on the C# language. It is current to Visual Studio 2019, .NET 5.0 and C# 9.0.

Prerequisites

Students should be an experienced application developer or architect. Some background in object-oriented programming would be helpful.

Duration

Two days

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I. . Introduction to NET
- A. What is .NET?
- B. .NET Framework, NET Core and .NET 5.0
- C. Application Models
- D. Managed Code
- E. Visual Studio 2019
- F. C# Console and GUI Programs

II. C# Overview for the Sophisticated Programmer
- A. First C# Console Application
- B. Namespaces
- C. Data Types
- D. Conversions
- E. Control Structures
- F. Subroutines and Functions
- G. Parameter Passing
- H. Strings
- I. Arrays
- J. Implicitly Typed Variables
- K. Console I/O
- L. Formatting
- M. Exception Handling

III. Object-Oriented Programming in C#
- A. Classes
- B. Access Control
- C. Methods and Properties
- D. Asymmetric Accessor Accessibility
- E. Static Data and Methods
- F. Constant and Readonly Fields
- G. Auto-Implemented Properties
- H. Inheritance
- I. Overriding Methods
- J. Abstract Classes
- K. Sealed Classes
- L. Access Control and Assemblies

IV. C# and the .NET Framework
- A. Components
- B. Interfaces
- C. System.Object
- D. .NET and COM
- E. Collections
- F. IEnumerable and IEnumerator
- G. Copy Semantics in C#
- H. Generic Types
- I. Type-Safe Collections
- J. Object Initializers
- K. Collection Initializers
- L. Anonymous Types
- M. Attributes

V. Delegates and Events
- A. Delegates
- B. Anonymous Methods
- C. Lambda Expressions
- D. Random Number Generation
- E. Events

VI. Introduction to Windows Forms
- A. Creating Windows Applications Using Visual Studio 2019
- B. Partial Classes
- C. Buttons, Labels and Textboxes
- D. Handling Events
- E. Listbox Controls

VII. Newer Features in C#
- A. Dynamic Data Type
- B. Named and Optional Arguments
- C. Variance in Generic Interfaces
- D. Asynchronous Programming Keywords
- E. New Features in C# 6.0 and C# 7.0
- F. Nullable Reference Types in C# 8.0
- G. Immutable Record Types in C# 9.0

VIII. Appendix A. Using Visual Studio 2019
- A. Signing in to Visual Studio
- B. Overview of Visual Studio 2019
- C. Creating a Console Application
- D. Project Configurations
- E. Debugging
- F. Multiple-Project Solutions

IX. Appendix B. Language Integrated Query (LINQ)
- A. What Is LINQ?
- B. Basic Query Operators
- C. Filtering
- D. Ordering
- E. Aggregation

X. Appendix C. Unsafe Code and Pointers in C#
- A. Unsafe Code
- B. C# Pointer Type
- C. Appendix D. Learning Resources