



Course 10266A:

Programming in C# with Microsoft Visual Studio 2010

Course Length: 5 days

Overview

The course focuses on C# program structure, language syntax, and implementation details with .NET Framework 4.0. This course describes the new enhancements in the C# 4.0 language by using Visual Studio 2010.

In this course, lower-intermediate level programmers gain the knowledge and skills they need to develop C# applications for the Microsoft .NET Framework 4.0. The course highlights the structure of C# 4.0 programs, language syntax, and implementation details. This course is not mapped to any exam.

Target Student

This course is intended for experienced developers who already have programming experience in C, C++, Visual Basic, or Java and understand the concepts of object-oriented programming.

This course is not designed for new programmers; it is targeted at professional developers with at least 12 months experience of programming in an object-oriented environment.

Objectives

After completing this course, students will be able to:

- Explain the purpose of the .NET Framework, and understand how to use C# and Visual Studio 2010 to build .NET Framework applications.
- Understand the syntax of basic C# programming constructs.
- Create and call methods in a C# application.
- Catch, handle and throw exceptions.
- Perform basic file IO operations in a C# application.
- Create and use new types (enumerations, classes, and structures), and understand the differences between reference types and value types.
- Control the visibility and lifetime of members in a type.
- Use inheritance to create new reference types.
- Manage the lifetime of objects and control the use of resources.
- Define properties and indexers to encapsulate data, and define operators for this data.
- Decouple an operation from the method that implements an operation, and use these decoupled operations to handle asynchronous events.
- Use collections to aggregate data, and use Generics to implement type-safe collection classes, structures, interfaces, and methods.
- Implement custom collection classes that support enumeration.
- Query in-memory data by using LINQ.

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- Integrate code written by using a dynamic language such as Ruby and Python, or technologies such as COM, into a C# application

Prerequisites

Before attending this course, students must have:

- At least 12 months experience working with an Object Oriented language
- Have C++ or Java knowledge:
- Creating Classes
- Inheritance and Abstraction
- Polymorphism
- Interfaces
- Exceptions
- Knowledge of the Visual Studio IDE.

Course Content

Module 1: Introducing C# and the .NET Framework

This module explains the .NET Framework, and using C# and Visual Studio 2010 for building .NET Framework applications.

Lessons

Introduction to the .NET Framework

Creating Projects Within Visual Studio 2010

Writing a C# Application

Building a Graphical Application

Documenting an Application

Running and Debugging Applications by Using Visual Studio 2010

Lab : Introducing C# and the .NET Framework

Building a Simple Console Application

Building a WPF Application

Verifying the Application

Generating Documentation for an Application

After completing this module, students will be able to:

Explain the purpose of the .NET Framework.

Create Microsoft Visual C# projects by using Visual Studio 2010.

Explain the structure of a C# application.

Use the WPF Application template to build a simple graphical application.

Use XML comments to document an application.

Use the debugger to step through a program.

Module 2: Using C# Programming Constructs

This module explains the syntax of basic C# programming constructs.

Lessons

Declaring Variables and Assigning Values

Using Expressions and Operators

Creating and Using Arrays

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Using Decision Statements

Using Iteration Statements

Lab : Using C# Programming Constructs

Calculating Square Roots with Improved Accuracy

Converting Integer Numeric Data to Binary

Multiplying Matrices

After completing this module, students will be able to:

Declare variables and assign values.

Create expressions by using operators.

Create and use arrays.

Use decision statements.

Use iteration statements.

Module 3: Declaring and Calling Methods

This module explains how to create and call methods.

Lessons

Defining and Invoking Methods

Specifying Optional Parameters and Output Parameters

Lab : Declaring and Calling Methods

Calculating the Greatest Common Divisor of Two Integers by Using Euclid's Algorithm

Calculating the GCD of Three, Four, or Five Integers

Comparing the Efficiency of Two Algorithms

Displaying Results Graphically

Solving Simultaneous Equations (optional)

After completing this module, students will be able to:

Describe how to declare and call methods

Define and call methods that take optional parameters and output parameters

Module 4: Handling Exceptions

This module explains how to catch exceptions and handle them. Students will also learn how to throw exceptions.

Lessons

Handling Exceptions

Raising Exceptions

Lab : Handling Exceptions

Making a Method Fail-Safe

Detecting an Exceptional Condition

Checking for Numeric Overflow

After completing this module, students will be able to:

Describe how to catch and handle exceptions

Describe how to create and raise exceptions

Module 5: Reading and Writing Files

This module explains how to perform basic file I/O operations in a C# application.

Lessons

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Accessing the File System

Reading and Writing Files by Using Streams

Lab : Reading and Writing Files

Building a Simple Editor

Making the Editor XML Aware

After completing this module, students will be able to:

Describe how to access the file system by using the classes that the .NET Framework provides.

Describe how to read and write files by using streams.

Module 6: Creating New Types

This module explains how to create and use new types (enumerations, classes, and structures)

Lessons

Creating and Using Enumerations

Creating and Using Classes

Creating and Using Structs

Comparing References to Values

Lab : Creating New Types

Using Enumerations to Specify Domains

Using a Struct to Model a Simple Type

Using a Class to Model a More Complex Type

Using a Nullable Struct

After completing this module, students will be able to:

Describe how to create and use enumerations.

Describe how to create and use classes.

Describe how to create and use structures.

Explain the differences between reference and value types.

Module 7: Encapsulating Data and Methods

This module explains how to control the visibility and lifetime of members in a type.

Lessons

Controlling Visibility of Type Members

Sharing Methods and Data

Lab : Encapsulating Data and Methods

Hiding Data Members

Using Static Members to Share Data

Implementing an Extension Method

After completing this module, students will be able to:

Describe how to control the visibility of type members.

Describe how to share methods and data.

Module 8: Inheriting From Classes and Implementing Interfaces

This module explains how to use inheritance to create new reference types

Lessons

Using Inheritance to Define New Reference Types

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Defining and Implementing Interfaces

Defining Abstract Classes

Lab : Inheriting From Classes and Implementing Interfaces

Defining an Interface

Implementing an Interface

Creating an Abstract Class

After completing this module, students will be able to:

Use inheritance to define new reference types.

Define and implement interfaces.

Define abstract classes.

Module 9: Managing the Lifetime of Objects and Controlling Resources

This module explains how to manage the lifetime of objects and control the use of resources.

Lessons

Introduction to Garbage Collection

Managing Resources

Lab : Managing the Lifetime of Objects and Controlling Resources

Implementing the IDisposable Interface

Managing Resources Used By an Object

After completing this module, students will be able to:

Describe how garbage collection works in the .NET Framework.

Manage resources effectively in an application.

Module 10: Encapsulating Data and Defining Overloaded Operators

This module explains how to create properties and indexers to encapsulate data, and how to define operators for this data.

Lessons

Creating and Using Properties

Creating and Using Indexers

Overloading Operators

Lab : Creating and Using Properties

Defining Properties in an Interface

Implementing Properties in a Class

Using Properties Exposed By a Class

Lab : Creating and Using Indexers

Implementing an Indexer to Access Bits in a Control Register

Using an Indexer Exposed by a Class

Lab : Overloading Operators

Defining the Matrix and MatrixNotCompatible Types

Implementing Operators for the Matrix Type

Testing the Operators for the Matrix Type

After completing this module, students will be able to:

Explain how properties work and use them to encapsulate data.

Describe how to use indexers to access data through an array-like syntax.

Describe how to use operator overloading to define operators for your own types.

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Module 11: Decoupling Methods and Handling Events

This module explains how to decouple an operation from the method that implements an operation, and how to use these decoupled methods to handle asynchronous events.

Lessons

Declaring and Using Delegates

Using Lambda Expressions

Handling Events

Lab : Decoupling Methods and Handling Events

Raising and Handling Events

Using Lambda Expressions to Specify Code

After completing this module, students will be able to:

Describe the purpose of delegates, and explain how to use a delegate to decouple an operation from the implementing method.

Explain the purpose of lambda expressions, and describe how to use a lambda expression to define an anonymous method.

Explain the purpose of events, and describe how to use events to report that something significant has happened in a type that other parts of the application need to be aware of.

Module 12: Using Collections and Building Generic Types

This module introduces collections, and describes how to use Generics to implement type-safe collection classes, structures, interfaces, and methods.

Lessons

Using Collections

Creating and Using Generic Types

Defining Generic Interfaces and Understanding Variance

Using Generic Methods and Delegates

Lab : Using Collections

Optimizing a Method by Caching Data

Lab : Building Generic Types

Defining a Generic Interface

Implementing a Generic Interface

Implementing a Test Harness for the BinaryTree Project

Implementing a Generic Method

After completing this module, students will be able to:

Use collection classes.

Define and use generic types.

Define generic interfaces and explain the concepts of covariance and contra variance.

Define and use generic methods and delegates.

Module 13: Building and Enumerating Custom Collection Classes

This module explains how to implement custom collection classes that support enumeration.

Lessons

Implementing a Custom Collection Class

Adding an Enumerator to a Custom Collection Class

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Lab : Building and Enumerating Custom Collection Classes

Implementing the IList TItem Interface

Implementing an Enumerator by Writing Code

Implementing an Enumerator by Using an Iterator

After completing this module, students will be able to:

Implement a custom collection class.

Define an enumerator for a custom collection class.

Module 14: Using LINQ to Query Data

This module explains how to query in-memory data by using LINQ.

Lessons

Using the LINQ Extension Methods and Query Operators

Building Dynamic LINQ Queries and Expressions

Lab : Using LINQ to Query Data

Using the LINQ Query Operators

Building Dynamic LINQ Queries

After completing this module, students will be able to:

Describe how to use the LINQ extension methods and query operators.

Describe how to build dynamic LINQ queries and expressions.

Module 15: Integrating Visual C# Code with Dynamic Languages and COM Components

This module explains how to integrate code written by using a dynamic language such as

Ruby and Python, and technologies such as COM, into a C# application

Lessons

Integrating C# Code with Ruby and Python

Accessing COM Components from C#

Lab : Integrating C# Code with Dynamic Languages and COM Components

Integrating Code Written by Using a Dynamic Language into a C# Application

Using a COM Component from Visual C# Application

After completing this module, students will be able to:

Integrate Ruby and Python code into a Visual C# application.

Invoke COM components and services from a C# application.