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Course 6367A:

Introduction to Object Oriented Programming using Microsoft Visual Studio 2008

Course Length: 3 days

Overview

This three-day instructor led course will enable attendees to start designing and developing object-oriented applications using Visual Studio 2008. Attendees will learn object-oriented concepts including classes, methods, properties, inheritance, and interfaces. Also they will learn how to identify opportunities to use these concepts in design, and how to implement these object-oriented concepts using Visual Studio 2008.

Target Student

The target audience for this course is lower-intermediate level programmers who have a minimum of three months programming experience in a professional environment and want to learn how to use Visual Basic or C# to develop well-conceived and implemented object-oriented programming applications.

Objectives

After completing this course, students will be able to:

- Describe the fundamentals of getting started with object-oriented development and review Visual Studio 2008 features.
- Describe classes and their importance in the basic structure of an object-oriented application.
- Add properties and methods to implement the internal functionality of a class.
- Implement inheritance, abstraction and polymorphism to reduce code duplication.
- Create structures that emphasize code reusability.
- Implement interfaces to establish “common” relationships between classes, reduce code dependencies, and facilitate code.
- Create an object-oriented structure design from a business problem.
- Create object-oriented structures based on their knowledge of classes, properties, methods, inheritance, and interfaces.
- Create and use delegates, events and exceptions to establish interclass communications.
- Design class interactions based on a set of business requirements.
- Design class interactions using methods, events, delegates and exceptions.
- Evaluate techniques to improve their own design.
- Evaluate a design pattern and determine its applicability to a business scenario.
- Create and maintain updatable units of software by deploying components and class libraries.
- Maintain an application without deploying the entire application.

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Prerequisites

Before attending this course, students must have:

- An understanding of the problem-solving techniques that apply to software development
- An understanding of the following principles of software development:
 - Modern software development models
 - Typical phases of a software development lifecycle
 - Concepts of event-driven programming
 - Concepts of object-oriented programming
 - Creating use-case diagrams
 - Designing and building a user interface
 - Developing a structured application
- A basic understanding of the following scripting techniques
 - Web scripting techniques
 - Macro scripting techniques
 - Windows scripting techniques
- Hands-on experience creating and implementing script code
- A fundamental understanding of the .NET Framework - specifically, the purpose, function, and features of following .NET Framework components:
 - The Common Language Runtime
 - The .NET Framework class library
- A conceptual understanding of the following .NET Framework topics:
 - Common Type System - identifies the types supported by the common language runtime
 - Metadata and Self-Describing Components - the .NET Framework simplifies component interoperability by allowing compilers to emit additional declarative information, or metadata, into all modules and assemblies
 - Cross-Language Interoperability - managed objects created in different programming languages can interact with one another
 - Assemblies in the Common Language Runtime - the concept of assemblies, which are collections of types and resources that form logical units of functionality (assemblies are the fundamental units of deployment, version control, reuse, activation scoping, and security permissions)
 - Application Domains - application domains provide isolation between applications
 - Runtime Hosts - the runtime hosts supported by the .NET Framework, including ASP.NET, Internet Explorer, and shell executable
- A basic understanding of the Visual Studio IDE (Integrated Development Environment)
- Hands-on experience using a version of Visual Studio .NET to achieve the following:
 - Declaring and initializing typed variables using the Camel case naming convention
 - Using arithmetic, relational, and logical operators in code statements
 - Using branching statements to control code execution

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- Using looping statements to iterate through collections or repeat steps until a specified condition is met
- Identifying syntax and logic errors
- Accessing and managing data from a data source

Course Content

Module 1: Getting Started with Object-Oriented Programming

This module provides fundamental knowledge required before getting started with object-oriented development. It also reviews Visual Studio 2008 features.

Lessons

Introduction to Object-Oriented Programming

Creating Projects in Visual Studio 2008

Coding in Visual Studio 2008

Productivity Features in Visual Studio 2008

Debugging Visual Studio Applications

Lab : Getting Started with Object-Oriented Development in Visual Studio 2008

Determining the Types of Projects for Solution

Creating the Solution and Projects

Adding Code to the Solution

Adding Comments to the Solution

Creating the Solution and Projects

After completing this module, students will be able to:

Describe what makes an object-oriented program different than a procedural based program.

List influencing factors that affect successful object oriented development.

Describe the overall design goals of an object-oriented application.

Explain how Visual Studio and .NET support developing object-oriented applications.

Describe the various project types supported by Visual Studio 2008 and when to use them.

Evaluate when to use Web site and Web application projects.

Create folders and files for the project types included in the 6367A lab application.

Describe the primary folders/file types included in each project.

Describe how .NET establishes and references .NET data types.

Create data types used within the lab application.

Manage data types used within the lab application.

Create basic programming structures and control flows within the Visual Studio 2008 IDE.

Manage basic programming structures and control flows within the Visual Studio 2008 IDE.

Describe Visual Studio 2008 productivity enhancements.

Use editing features such as edit marks, code snippets and refactoring in Visual Studio 2008.

Create code comments.

Generate documentation from code comments.

Troubleshoot coding errors using the debugging interface.

Test for business logic errors during design time.

Module 2: Implementing Classes, Properties and Methods

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This module explains classes and their importance in the basic structure of an object-oriented application. It also add properties and methods to implement the internal functionality of a class.

Lessons

Creating Classes

Implementing Properties Within a Class

Implementing Methods Within a Class

Using Classes, Properties and Methods

Lab : Implementing Classes with Properties and Methods in Visual Studio 2008

Creating a Class Structure

Adding Properties to a Class Structure

Adding Methods to a Class Structure

Instantiating and Using a Class within an Application

Implementing a Shared Method

After completing this module, students will be able to:

Create a class structure within an object-oriented application.

Describe the relationship between classes, properties and methods.

Describe the relationship between classes and objects.

Describe the instantiation process of an object.

Create properties within class structures to maintain class specific data within Visual Studio projects.

Control access to properties.

Simplify property creation syntax by using default properties.

Create value type and reference type based properties.

Define the syntax of a basic method.

Use value and reference types as parameters and as return types of a method.

Create overloaded methods.

Control access to methods.

Control class construction using constructors.

Create objects from classes.

Access the properties of a class instance.

Invoke the methods of a class instance.

Invoke a shared method of a class instance.

Module 3: Implementing Inheritance, Abstraction, and Polymorphism

This module explains how to implement inheritance, abstraction and polymorphism to reduce code duplication. It also describes how to create structures that emphasize code reusability.

Lessons

Introduction to Inheritance and Abstraction

Implementing Inheritance and Abstraction

Introduction to Polymorphism

Implementing a Polymorphic Structure

Lab : Implementing Inheritance and Abstraction

Implementing Inheritance Within the Class Structures

Implementing Abstraction Within the Class Structures

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Implementing Polymorphism Within the Lab Application

After completing this module, students will be able to:

Explain how to reduce code duplication can be reduced by using inheritance and abstraction.

Explain how to increase code reuse can be increased by using inheritance and abstraction.

Identify the impact of inheritance on class structures.

Write code to create an inherited class.

Write code to create an abstract class.

Manage the relationship between a base class and a derived class.

Manage the construction of inherited class structure.

Explain the importance of implementing dynamic code.

Explain how polymorphism can create dynamic code at runtime within inherited class structures.

Explain the importance of decoupling inherited class functionality from runtime control code.

Explain how polymorphism can simplify the code required by the runtime portion of the application.

Identify uses of polymorphism within a business scenario.

Write code to create a polymorphic structure.

Write code to use a polymorphic structure.

Create a polymorphic solution that reduces control code logic.

Create a polymorphic solution that decouples class dependencies.

Module 4: Implementing Interfaces

This module explains how to implement interfaces to establish common relationships between classes, reduce code dependencies, and facilitate code standardization.

Lessons

Introduction to Interfaces

Implementing a Custom Interface

Lab : Implementing Interfaces

Writing Code to Use a System-Defined Interface

Defining a Custom Interface

Implementing a Custom Interface

Implementing Polymorphism with Interfaces

After completing this module, students will be able to:

Explain the importance of reducing code dependencies.

Explain how dependencies between classes can be reduced by implementing interfaces.

Explain the importance of code standardization.

Explain how code standardization can be increased through implementing interfaces.

Identify uses of interfaces within a business scenario.

Create an interface.

Describe commonly used system-defined interfaces.

Write code to implement an interface.

Use an interface to access the functionality within a class.

Use an interface with a polymorphic class structure.

Module 5: Designing Object-Oriented Structures

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This module explains the process of creating an object-oriented structure design from a business problem. It also describes how to create object-oriented structures based on their knowledge of classes, properties, methods, inheritance, and interfaces. And last, the students will review and refine their designs.

Lessons

Establishing Classes from Business Requirements

Adding Inheritance to the Design

Adding Interfaces to the Design

Reviewing and Refining the Design

Lab : Designing Object-Oriented Structures

Creating a Draft Class Diagram from the Business Scenario

Adding Properties and Methods to the Class Diagram

Adding Inheritance to the Class Diagram

Adding Interfaces to the Class Diagram

Refining the Design

After completing this module, students will be able to:

Review the goals of object-oriented design.

Describe approaches to create an object-oriented design based on business requirements.

Create a class diagram to document the design.

Identify classes based on business requirements.

Diagram an initial class structure to fulfill business requirements.

Identify the properties and methods based on business requirements.

Diagram properties and methods to fulfill business requirements.

Describe approaches of designing inherited class structures based on business requirements.

Identify inherited class structures based on business requirements.

Add inherited structures to the proposed class diagram.

Critique the methods and property placement within the new class diagram.

Modify the methods and property placement within the new class diagram.

Describe approaches of designing interface structures from business requirements.

Identify interfaces based on business requirements.

Modify the class diagram to include interfaces.

Determine if a proposed design meets the business requirements.

Determine if a proposed design follows the principals of object-oriented application design.

Determine the effect of future usage on the completed class diagram.

Module 6: Delegates, Events, and Exceptions

This module explains how to create and use delegates, events and exceptions to establish interclass communications.

Lessons

Introduction to Delegates

Implementing Delegates

Introduction to Events

Implementing Events

Introduction to Exceptions

Implementing Exceptions

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Lab : Implementing Delegates and Events

Implementing a Delegate

Implementing a Custom Event

Implementing an Event Handler for System Events

Lab : Implementing Exceptions

Implementing Custom Exceptions

Managing System Exceptions

After completing this module, students will be able to:

Explain the importance of interclass communications.

Describe the delegate model.

Explain how the delegate model can decouple class dependencies and increase code reusability.

Identify uses of delegates within a business scenario.

Define the syntax required to implement a delegate within a class.

Define the syntax required to use a delegate from a calling class.

Use delegates to establish interclass communications.

Describe the system event model and its importance to object-oriented applications.

Describe the benefits of creating custom events within an object-oriented application.

Identify appropriate uses of system and custom events.

Apply the syntax required to create a system event handler within a class.

Apply the syntax required to create a custom event.

Apply the syntax required to create a custom event handler.

Describe the exception model used within .NET applications.

Explain how exception management can help mitigate runtime errors within an application.

Describe differences in object-oriented exception management versus procedural-based exception management.

Identify uses of exception management given a business scenario.

Apply the syntax used to handle a system-generated exception within a class.

Apply the syntax used to create a custom exception.

Apply the syntax used to throw a custom exception.

Implement a solution that uses exceptions to mitigate runtime errors.

Module 7: Designing Object Collaboration

This module explains how to design collaborations between classes by using methods, events, exceptions and delegates. It also introduces sequence diagrams as a way of documenting and planning class interactions.

Lessons

Introduction to Class Interactions

Adding Interactions to a Design

Evaluating the Design

Introduction to Patterns

Lab : Designing Object-Oriented Interactions

Design Interactions Using Methods

Design Interactions Using Events, Delegates, and Exceptions

Evaluating and Refining the Design

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Evaluating a Pattern

After completing this module, students will be able to:

Define design goals to create class interactions.

Identify differences between events, exceptions, delegates and direct method invocation to implement an interaction design.

Describe evaluation approaches and criteria to determine if a design is effective in solving a business problem.

Determine interaction boundaries within an object-oriented design to decouple class structures.

Organize an application to decouple dependencies between code.

Determine the best communication method between classes given a business requirement.

Diagram class interactions.

Determine the overall effectiveness of the design in meeting the business requirements.

Evaluate the overall design against object-oriented design best practices.

Critique the design using evaluation techniques.

Describe design patterns and their importance to object-oriented design.

Determine the applicability of a design pattern to a business scenario.

Apply a design pattern to an existing solution.

Module 8: Deploying Components and Class Libraries

This module explains how to create and maintain updatable units of software by deploying components and class libraries. It also describes how to maintain an application without redeploying the entire application.

Lessons

Introduction to Components and Class Libraries

Deploying a Component/Class Library

Best Practices for Deploying a Component/Class Library

Lab : Deploying Components/Class Libraries

Creating a Component/Class Library

Deploying the Application

Updating the Component/Class Library

Deploying an Updated Component/Class Library

After completing this module, students will be able to:

Explain the importance of creating deployable units of software.

Describe the software development lifecycle with respect to upgrading and maintenance.

Determine uses of components and class libraries given a business scenario.

Prepare an application to use component/class libraries.

Create a component/class library.

Deploy a component/class library.

Manage versioning within an application using a component/class library.

Describe best practices for deploying component/class libraries.

Identify code that maximizes component/class library usage.

Explain how a component/class library meets best practices.

Additional Reading

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To help you prepare for this class, review the following resources:

[Visual Studio 2005 Class Designer](#)

[Default Project Templates in Visual Studio](#)

[Web Application Projects Overview](#)

[Value Types in the Common Type System](#)

[Type Fundamentals](#)

[System.Collections.Generic Namespace](#)

[IConvertible Interface](#)

[XML Documentation Comments \(C# Programming Guide\)](#)