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VISUAL BASIC[®] 2005

HOW TO PROGRAM

THIRD EDITION

Pearson International Edition

H. M. Deitel

Deitel & Associates, Inc.

P. J. Deitel

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Preface

"Live in fragments no longer, only connect."

—Edgar Morgan Foster

Welcome to the world of Windows, Internet and Web programming with Visual Basic, Visual Studio 2005 and the .NET 2.0 platform! This book presents leading-edge computing technologies for computer science students, software developers and IT professionals.

At Deitel & Associates, we write computer science textbooks for college students and professional books for software developers. We also teach this material in industry seminars at organizations worldwide.

This book was a joy to create. To start, we put the previous edition under the microscope:

- We audited our Visual Basic presentation against the most recent Microsoft Visual Basic Language Specification, which can be found at www.microsoft.com/downloads/details.aspx?FamilyID=6d50d709-aaa4-44d7-8af3-e14280403e6e&DisplayLang=en.
- All of the chapters have been significantly updated and upgraded.
- We changed to an early classes and objects pedagogy. Now readers build reusable classes starting with a very friendly treatment in Chapter 4.
- We updated our object-oriented presentation to use the latest version of the *UML (Unified Modeling Language)*—*UML™ 2.0*—the industry-standard graphical language for modeling object-oriented systems.
- We added an optional OOD/UML automated teller machine (ATM) case study in Chapters 1, 3–9 and 11. The case study includes a complete Visual Basic code implementation of the ATM in Appendix J.
- We added several multi-section, object-oriented programming case studies.
- We incorporated key new features of Microsoft's latest release of Visual Basic—Visual Basic 2005—and added discussions on generics, .NET remoting and debugging.
- We significantly enhanced our treatment of XML, ADO.NET, ASP.NET and Web services.

All of this has been carefully scrutinized by a substantial team of academics, .NET industry developers and members of the Microsoft Visual Basic development team.

We believe that this book and its support materials have everything instructors and students need for an informative, interesting, challenging and entertaining Visual Basic educational experience. In this Preface, we overview various conventions used in the book,

such as syntax coloring the code examples and code highlighting. We also discuss the book's comprehensive suite of ancillary materials that help instructors maximize their students' learning experience, including the Prentice Hall *Instructor's Resource Center*, PowerPoint® Slide lecture notes, companion Web site, SafariX (Pearson Education's WebBook publications) and more.

Visual Basic 2005 How to Program, 3/e presents 220 complete, working Visual Basic programs and depicts their inputs and outputs in actual screen shots of running programs. This is our signature "live-code" approach—we present concepts in the context of complete working programs.

As you read this book, if you have questions, send an e-mail to deitel@deitel.com; we will respond promptly. For updates on this book and the status of Visual Basic software, and for the latest news on all Deitel publications and services, visit www.deitel.com regularly and be sure to sign up for the free *Deitel® Buzz Online* e-mail newsletter at www.deitel.com/newsletter/subscribe.html.

Before You Begin

Downloading Microsoft Visual Basic 2005 Express Edition Software

On November 7, 2005 Microsoft released its Visual Studio 2005 development tools, including the Visual Basic 2005 Express Edition. Per Microsoft's Web site, Microsoft Express Editions are "lightweight, easy-to-use and easy-to-learn tools for the hobbyist, novice and student developer." According to the Microsoft Express Editions FAQ page (msdn.microsoft.com/vstudio/express/support/faq/), "Effective April 19th, 2006, all Visual Studio 2005 Express Editions are free permanently. SQL Server 2005 Express Edition has always been and will continue to be a free download."

You may use this software to compile and execute the example programs in the book. You can download Visual Basic 2005 Express Edition at:

msdn.microsoft.com/vstudio/express/vb/

When you install this software, you should install the help documentation and SQL Server 2005 Express. Microsoft provides a dedicated forum for help using the Express Edition:

forums.microsoft.com/msdn/ShowForum.aspx?ForumID=24

Visual Basic 2005 How to Program, 3/e Code Examples

The book's source code is available for download at www.deitel.com/books/vbhttp3. Once you download the complete `examples.zip` file, use a ZIP file tool such as WinZip (available from www.winzip.com) to extract the files to the C:\ folder on your computer. This will create an `examples` folder that contains subfolders for each chapter (e.g., `ch01`, `ch02`, etc.)

Additional Software Downloads

For the examples in Chapter 17, Graphics and Multimedia, we use Microsoft Agent. If students use the examples in a lab environment, more than likely this software will have to be installed as part of the lab setup. Microsoft Agent can be downloaded from:

www.microsoft.com/msagent/downloads/default.asp

For Chapter 20, you will need SQL Server 2005 Express Edition, which is available at

msdn.microsoft.com/vstudio/express/sql/

Note that you do not need to download this separately if you choose to install it as part of the Visual Basic 2005 Express installation.

For Chapters 21 and 22, you will need Visual Web Developer 2005 Express Edition, which is available at

msdn.microsoft.com/vstudio/express/vwd/

Like Visual Basic 2005 Express, the other express editions are free for download until November 6, 2006, after which Microsoft may charge a fee for these tools. For these two chapters, you may also want to install the IIS Web server to test the examples. For more information about installing IIS, please visit

www.microsoft.com/resources/documentation/windows/xp/all/proddocs/en-us/iiisin2.msp?mfr=true

If you prefer not to install IIS, you can use the built-in test server in Visual Web Developer 2005 Express to test the examples in Chapters 21 and 22.

We provide updates on the status of the software used in this book at www.deitel.com and in our free e-mail newsletter www.deitel.com/newsletter/subscribe.html.

Features in Visual Basic 2005 How to Program, 3/e

This new edition contains many new and enhanced features.

Updated for Visual Studio 2005, Visual Basic 2005 and .NET 2.0

We updated the entire text to reflect Microsoft's latest release of Visual Basic 2005. New items include:

- Screenshots updated to the Visual Studio 2005 IDE.
- Property accessors with different access modifiers.
- Viewing exception data with the Exception Assistant (a new feature of the Visual Studio 2005 Debugger).
- Using drag-and-drop techniques to create data-bound windows forms in ADO.NET 2.0.
- Using the IDE's Data Sources window to create application-wide data connections.
- Using a BindingSource to simplify the process of binding controls to an underlying data source in ADO.NET 2.0.
- Using a BindingNavigator to enable simple navigation, insertion, deletion and editing of database data on a Windows Form.
- Using the Master Page Designer to create a common look and feel for ASP.NET Web pages.
- Using Visual Studio 2005 smart tag menus to perform common programming tasks when new controls are dragged onto a Windows Form or ASP.NET Web page.

- Using Visual Web Developer's built-in Web server to test ASP.NET 2.0 applications and Web services.
- Using an `XmlDataSource` to bind XML data sources to a control.
- Using a `SqlDataSource` to bind a SQL Server database to a control or set of controls.
- Using an `ObjectDataSource` to bind a control to an object that serves as a data source.
- Using the ASP.NET 2.0 "login" and "create new user" controls to personalize access to Web applications.
- Using generics and generic collections to create general models of methods and classes that can be declared once, but used with many types of data.
- Using generic collections from the `System.Collections.Generic` namespace.

New Interior Design

Working with the creative services team at Prentice Hall, we redesigned the interior styles for our *How to Program Series* books. In response to reader requests, we now place the key terms and the index's page reference for each defining occurrence in bold blue text for easier reference. We emphasize on-screen components in the bold Helvetica font (e.g., the File menu) and emphasize Visual Basic program text in the Lucida font (for example, `int x = 5`).

Syntax Coloring

We syntax color all the Visual Basic code, similar to the way most Visual Basic integrated-development environments and code editors syntax color code. This greatly improves code readability—an especially important goal, given that this book contains 16,400+ lines of code. Our syntax-coloring conventions are as follows:

- comments appear in green
- keywords appear in dark blue
- errors and ASP.NET delimiters appear in red
- constants and literal values appear in light blue
- all other code appears in plain, black

Code Highlighting

Extensive code highlighting makes it easy for readers to spot each program's featured code segments—we place gray rectangles around the key code.

Early Classes and Objects Approach

We still introduce basic object-technology concepts and terminology in Chapter 1. In the previous edition, we developed custom classes in Chapter 9, but in this edition, we start doing that in the completely new Chapter 4. Chapters 5–8 have been carefully rewritten with a very friendly "early classes and objects approach."

Carefully Tuned Treatment of Object-Oriented Programming in Chapters 9–11

We performed a high-precision upgrade of *Visual Basic 2005 How to Program, 3/e*. This edition is clearer and more accessible—especially if you are new to object-oriented programming (OOP). We completely rewrote the OOP chapters, integrating an employee payroll class hierarchy case study and motivating interfaces with an accounts payable hierarchy.