



R E F A C E

Welcome to the Visual Basic® 2010 programming language and the world of Microsoft® Windows®, and Internet and web programming with Microsoft's .NET 4.0 platform! At Deitel & Associates, we write programming language textbooks, professional books and LiveLessons video products for Pearson and deliver programming courses at corporate, government, military and academic organizations worldwide. This book, which is part of our *Simply* series, has been updated based on Visual Studio 2010 and .NET 4.0. Our goal was to write a book that focuses on core concepts and features while keeping the discussion as simple as possible. The book is intended for readers using recent versions of Windows®.

To achieve this goal, we implemented an innovative teaching methodology. We present the core concepts of leading-edge computing technologies using the APP-DRIVEN approach, combined with the DEITEL® signature LIVE-CODE approach of teaching programming using complete, working, real-world apps. We merged the notion of a lab manual with that of a conventional textbook, creating a book that works well in a traditional classroom setting or with students sitting at computers and building each example app as they read the chapters. The book is also appropriate for online distance learning courses.

As students work through the chapters, they learn conventional and visual programming fundamentals, graphical-user-interface (GUI) components, file processing, database processing and web-based apps development. Most sections are followed by self-review questions with answers, so that students receive immediate feedback.

We believe that this book and its support materials provide students and professionals with an informative, interesting, challenging and entertaining Visual Basic educational experience. We provide a suite of supplementary materials that help instructors maximize their students' learning experience.

As you read the book, if you have questions, e-mail us at deitel@deitel.com; we'll respond promptly. For updates on this book and its supporting Visual Basic software, visit www.deitel.com/books/SimplyVB2010/, join our social networking communities on Facebook (www.deitel.com/deitelfan), Twitter (@deitel) and Google+ (gplus.to/deitel), and subscribe to the *Deitel® Buzz Online* newsletter (www.deitel.com/newsletter/subscribe.html).

***New and Updated
Features in Simply Visual
Basic 2010, Fourth
Edition***

Here are some of the key features of the fourth edition of *Simply Visual Basic 2010*:

- ***New Chapter 1.*** The new Chapter 1 engages students with intriguing facts and figures to get them excited about learning to program. The chapter includes a table of some of the research made possible by computers and the Internet, current technology trends and hardware discussion, the data hierarchy, a new section on social networking, a table of popular web services, a table of business and technology publications and websites that will help you keep up with the latest technology news and trends, and updated exercises. Students also get hands-on experience by test-driving a fun painter app.
- ***Making a Difference Exercises Set.*** We encourage you to use computers and the Internet to research and solve problems that really matter. These new exercises are meant to increase awareness of important issues the world is facing. We hope you'll approach them with your own values, politics and beliefs.
- ***Up-to-date with Visual Basic 2010, the Visual Studio 2010 IDE and .NET 4.***
- ***LINQ.*** LINQ (Language-Integrated Query) is one of the most important newer features in Visual Basic. LINQ provides a uniform syntax for querying data, and it enables insert, update and delete operations. Strong typing enables Visual Studio to provide *IntelliSense* support for LINQ operations and results. LINQ can be used on different types of data sources, including collections (LINQ to Objects, Chapters 20, 21 and 23) and databases (LINQ to SQL, Chapters 27 through 29). Many of the new Visual Basic language features we cover were introduced to support LINQ.
- ***Databases.*** We use real-world apps to teach the fundamentals of database programming using the free Microsoft SQL Server Express Edition. Chapters 27–29 discuss database and LINQ to SQL fundamentals, presented in the context of an **Address-Book** desktop app, a **Guestbook** web app and a **Password-Protected Book Information** web app, respectively. Chapter 27 also demonstrates using the Visual Studio tools to build a GUI that uses LINQ to SQL to access the database.
- ***Windows Presentation Foundation (WPF) GUI and Graphics.*** Graphics make apps fun to create and use. In our introduction to graphics, Chapter 25, we discuss Graphical Device Interface (GDI+)—the Windows service that provides the graphical features used by Windows Forms apps in Visual Studio 2010—to teach students to print a personalized bank check. We extend our coverage of GUI and graphics in Chapter 26 with an introduction to Windows Presentation Foundation (WPF)—Microsoft's framework that integrates GUI, graphics and multimedia capabilities. We present a WPF-based painting app to demonstrate WPF GUI and graphics capabilities.
- ***ASP.NET 4.*** Microsoft's .NET server-side technology, ASP.NET 4, enables you to create robust, scalable web-based applications. In Chapters 27–29, you'll build several applications, including a web-based **Guestbook** application that uses ASP.NET, LINQ and a `LinqDataSource` to store data in a database and display data in a web page. The chapter also discusses the ASP.NET Development Server for testing your web applications on your local computer. Chapter 29 adds for this new edition a password-protected, web-based books database app and an ASP.NET Ajax validation app that demonstrates how Ajax technology can give web-based apps the responsiveness and look-and-feel of desktop apps.
- ***Conditional If Expressions.*** Visual Basic provides a new conditional If expression (introduced in Chapter 7), which consists of a condition, a true expression and a false expression. It tests its condition, then evaluates to its

true or false expression based on the truth or falsity of the condition. This can be used as shorthand notation for some If...Then...Else statements.

- **Local Type Inference.** When you initialize a local variable in its declaration, you can now omit the variable’s type—the compiler infers it from the variable’s initializer value (introduced in Chapter 11).
- **Optional Parameters.** You can specify method parameters with default values—if a corresponding method argument isn’t provided in the method call, the compiler inserts the optional parameter’s default value in the call (introduced in Chapter 13).
- **Object Initializers.** When creating a new object, you can use the new object initializer syntax to assign values to the new object’s properties (introduced in Chapter 23).
- **“Quick Fix” Window.** The IDE now provides an **Error Correction Options** window that enables you to quickly fix certain common programming errors (introduced in Chapter 5).
- **We emphasize the IDE’s IntelliSense feature** that helps you write code faster and with fewer errors.

Pedagogic Features in Simply Visual Basic 2010, Fourth Edition

This book is loaded with pedagogic features for students and instructors including:

- **APP-DRIVEN Approach.** Each chapter uses a contemporary, real-world app to teach programming concepts. The examples and exercises are up-to-the-minute with common desktop, Internet and web apps. An alphabetical list of these apps appears in Fig. 1. All of the chapter examples have a business, home or personal focus. At the beginning of each chapter, students “test-drive” the completed app so they can see how it works. Then they build the app by following detailed, step-by-step instructions. The book concentrates on the principles of good software engineering and stresses program clarity.
- **LIVE-CODE Approach.** This book emphasizes LIVE-CODE examples. Each chapter ends with the complete, working program code, and the students can run the app that they just created. We call this method of teaching and writing the *Live-Code Approach*.
- **Real-World Technologies.** This text incorporates contemporary technologies to develop useful apps. For example, we use the Unified Modeling Language® (UML) to replace flowcharts—an older standard. The UML has become the preferred graphical modeling language for designing object-oriented apps. In *Simply Visual Basic 2010, 4/e* we use the UML to show the flow of control for several control statements, so students gain practice reading the type of diagrams that are used in industry.
- **Visual Programming and Graphical User Interfaces (GUIs).** From the first chapter, we immerse students in visual programming techniques, which students use to create and modify GUI-based programs quickly and easily. The early chapters provide students with a foundation for designing GUIs—concepts that they’ll apply throughout the book. Many chapters contain GUI Design Tips that are summarized at the end of the chapter for easy reference. Appendix C compiles the GUI Design Tips.
- **Windows Forms vs. Windows Presentation Foundation (WPF).** Microsoft recommends that developers use Windows Forms rather than WPF for line-of-business apps, which is the primary market for students and professionals reading this book. We implement most of our GUIs with Windows Forms, but we also introduce WPF, which Microsoft recommends for more advanced GUI, graphics and multimedia apps.

Apps in *Simply Visual Basic 2010, 4/e*

Account Information	Encryption	Photo Album
Address Book	Enhanced Dental Payment	Pig Latin
Address Book GUI	Factorial	Present Value Calculator
Advanced Painter	Fee Calculator	Prime Numbers
Airline Reservation	File Scrape	Quiz Average
Alarm	Flag Quiz	Radio GUI
Alarm Clock GUI	Food Survey	Restaurant Bill
Anagram Game	Form Painter	Road Sign Test
Arithmetic Calculator	Fund Raiser	Salary Survey
Average Three Numbers	Fuzzy Dice Order Form	Sales Commission
Birthday Saver	Gas Pump	Sales Report
Bookstore	Grade Calculator	Savings Calculator
Bouncing Ball Game	Guess the Number	Schedule Book
Cafeteria Survey	Guest Book	Screen Saver
Calculator GUI	Income Tax Calculator	Screen Scraping
Car Payment Calculator	Interest Calculator	Security Panel
Car Reservation	Inventory	Shipping Hub
Cash Register	Inventory Enhancement	Shipping Time
“Cat and Mouse” Painter	Length/Distance Converter	Sibling Survey
Cell Phone GUI	Letterhead Designer	Simple Calculator
Check Writer	Line Length	Simple Encryption
Circle Painter	Lottery Picker	Student Grades
Class Average	Maximum	Supply Cost Calculator
Company Logo Designer	Microwave Oven	Task List
Compound Interest	Microwave Oven GUI	Temperature Converter
Counter	Miles Per Gallon	Ticket Information
Craps Game	Monitor Invoice GUI	To-Do List
Currency Converter	Mortgage Calculator	Typing Tutor
Charge Account Analyzer	Multiplication Teacher	Vending Machine GUI
Dental Payment	Odd Numbers	Wage Calculator
Dice Simulator	Office Supplies	Weather Viewer
Digit Extraction	Password GUI	Welcome
Discount Calculator	Pay Raise Calculator	
Display Square	Phone Book	

Figure 1 Apps in *Simply Visual Basic 2010*’s examples and exercises.

- **Syntax Shading.** For readability, we syntax shade the code, similar to the way most integrated-development environments and code editors syntax color the code. Our syntax-shading conventions are:

```

comments appear like this
keywords appear like this
literal values appear like this
text, class, method, variable and property names appear in black

```

- **Object-Oriented Programming.** Object-oriented programming is the most widely employed technique for developing robust, reusable software, and

Visual Basic 2010 offers substantial object-oriented programming features. This book introduces students to defining classes and using objects, laying a foundation for more advanced programming courses.

- **Visual Studio 2010 Debugger.** Debuggers are software tools that help programmers find and correct logic errors in program code. Visual Studio 2010 contains a powerful debugger that allows you to analyze your programs line-by-line as they execute. Throughout the book, we teach the Visual Studio 2010 Debugger; we explain how to use its key features and offer many debugging exercises.

To the Instructor *Focus of the Book*

Simply Visual Basic 2010, 4/e is intended for introductory-level courses and course sequences in computer programming for students with little or no programming experience. This book teaches computer programming principles and the Visual Basic 2010 language, including data types, control statements, object-oriented programming, .NET Framework Class Library classes, GUI concepts, event-driven programming, database and web apps development, and more. After mastering the material in this book, students will be able to program in Visual Basic 2010 and to employ many key capabilities of the .NET 4.0 platform.

The book is up-to-date with Microsoft's Visual Studio 2010, which includes Visual Basic 2010. We rebuilt every app in the book using the 2010 software. All apps and solutions have been fully tested on this platform.

A Note Regarding Software for the Book

This book includes the Microsoft® Visual Studio® 2010 Express Editions All-in-One DVD, which contains the Visual Basic® 2010 Express Edition (and other Microsoft development tools). These tools are also downloadable from

www.microsoft.com/express/Windows

We wrote *Simply Visual Basic 2010* using Visual Basic® Express Edition. You can learn more about Visual Basic® at msdn.microsoft.com/en-us/vstudio/default.aspx. For more information about setting up your computer to work with the examples and exercises in this book, see the Before You Begin section that follows this Preface.

A Note Regarding Terminology Used in the Book

In Chapter 13, we discuss methods as Sub procedures (sometimes called subroutines) and Function procedures (sometimes called functions). We use this terminology for two reasons. First, the keywords Sub and Function are used in procedure and method definitions, so this naming is logical for students. Second, Visual Basic professionals have used this terminology for years and will continue to do so. We also use the term “function” at certain points in this text to refer to Visual Basic 6 Function procedures that remain in Visual Basic 2010 (such as Pmt). When we introduce object-oriented programming concepts in Chapter 19, we discuss the difference between procedures and methods and indicate that the procedures defined throughout the text are, in fact, methods.

Objectives

Each chapter begins with objectives that inform students of what to expect and give them an opportunity, after reading the chapter, to determine whether they've met the intended goals.

Outline

The chapter outline enables students to approach the material in top-down fashion. Along with the chapter objectives, the outline helps students anticipate topics and set an appropriate learning pace.

Example Apps (with Outputs)

We present Visual Basic 2010 features in the context of complete, working programs. All examples are available as downloads from:

www.deitel.com/books/SimplyVB2010/

Illustrations/Figures/“ACE” Tables

Abundant charts, line drawings and app outputs are included. The control-statements discussion, for example, features carefully drawn UML activity diagrams. [Note: We do not teach UML diagramming as an app-development tool, but we do use UML diagrams to explain the precise operation Visual Basic 2010’s control statements.] Most chapters include our “ACE” tables that list the actions, controls and events that are crucial to implementing object-oriented apps.

Programming Tips

Hundreds of programming tips help students focus on important aspects of app development. These tips and practices represent the best the authors have gleaned from a combined seven decades of programming and teaching experience.



Good Programming Practice

Good Programming Practices call attention to techniques that will help students produce programs that are clearer, more understandable and more maintainable.



Common Programming Error

Students tend to make certain errors frequently. Pointing out these *Common Programming Errors* reduces the likelihood that they’ll make these same mistakes.



Error-Prevention Tip

These tips contain suggestions for exposing bugs and removing them from students’ programs; many describe aspects of Visual Basic 2010 that prevent bugs from getting into programs in the first place.



Portability Tip

We include *Portability Tips* to help students write code that will run on a variety of platforms and to explain how Visual Basic 2010 achieves its high degree of portability among .NET 4.0 platforms.



Software Design Tip

The *Software Design Tips* highlight architectural and design issues that affect the construction of software systems.



GUI Design Tip

The *GUI Design Tips* highlight graphical-user-interface conventions to help students design attractive, intuitive, user-friendly GUIs.

Skills Summary

Most chapters include a bullet-list-style summary of the new programming concepts presented. This reinforces key actions taken to build the app in each chapter.

Key Terms

Each chapter includes a list of important terms defined in the chapter. These terms and definitions also appear in the index and in a bookwide glossary, so the student can locate terms and their definitions quickly.

Self-Review Questions and Answers

Self-review multiple-choice questions and answers are included after most sections to build students' confidence with the material and prepare them for the regular exercises. Students should be encouraged to attempt all the self-review exercises and check their answers.

Exercises (Solutions in Instructor Solutions Manual)

Each chapter concludes with exercises. Typical exercise sections include 10 multiple-choice questions, a “What does this code do?” exercise, a “What’s wrong with this code?” exercise, three programming exercises and a programming challenge. [Note: In the “What does this code do?” and “What's wrong with this code?” exercises, we show only portions of the code in the text.]

The questions involve simple recall of important terminology and concepts, writing individual Visual Basic 2010 statements, writing small portions of Visual Basic 2010 apps and writing complete Visual Basic 2010 methods, classes and apps. Every programming exercise uses a step-by-step methodology to suggest how to solve the problems. The solutions for the exercises are *available only to instructors* through their Prentice-Hall representatives.

GUI Design Guidelines

Consistent and proper graphical-user-interface design is crucial to visual programming. In each chapter, we summarize the GUI design guidelines that were introduced. Appendix C presents a cumulative list of these GUI design guidelines for easy reference.

Controls, Events, Properties & Methods Summaries

Most chapters include a summary of the controls, events, properties and methods covered in the chapter. The summary includes a picture of each control, shows the control “in action” and lists the control’s properties, events and methods that were discussed up to and including that chapter.

Thousands of Index Entries

We have included an extensive index which is especially useful when you use the book as a reference.

Double Indexing of Visual Basic 2010 Code Examples

For every source-code program in the book, we index the figure caption both alphabetically and as a subindex item under “Examples.” This makes it easier to find examples using particular features.

Instructor Resources for Simply Visual Basic 2010, Fourth Edition

The following supplements are available to *qualified instructors only* through Pearson Education’s Instructor Resource Center (www.pearsonhighered.com/irc):

- **PowerPoint® slides** containing all the code and figures in the text, plus bulleted items that summarize key points.
- **Test Item File** of multiple-choice questions (approximately two per book section)
- **Solutions Manual** with solutions to many of the end-of-chapter exercises. Please check the Instructor Resource Center to determine which exercises have solutions.

Please do not write to us requesting access to the Pearson Instructor’s Resource Center. Access is restricted to college instructors teaching from the book. Instructors may obtain access only through their Pearson representatives. If you’re not a registered faculty member, contact your Pearson representative or visit

www.pearsonhighered.com/educator/replocator/

Solutions are *not* provided for “project” exercises. Check out our Programming Projects Resource Center for lots of additional exercise and project possibilities (www.deitel.com/ProgrammingProjects/).

CourseSmart Web Books

Students and instructors have increasing demands on their time and money. Pearson has responded by offering digital texts and course materials online through CourseSmart. Faculty can now review course materials online. Students can access a digital version of a text for less than the cost of a print book and can see the same content as in the print textbook enhanced by search, note-taking and printing tools. For detailed information on the CourseSmart version of *Simply Visual Basic 2010, 4/e*, visit www.coursesmart.com.

Deitel Online Resource Centers

Our website www.deitel.com provides Resource Centers on various topics of interest to our readers—see the list of Resource Centers in the first few pages of this book and visit www.deitel.com/ResourceCenters.html. We’ve found many exceptional resources online, including tutorials, documentation, software downloads, articles, blogs, podcasts, videos, code samples, books, e-books and more—most are free. Some of the Resource Centers you might find helpful while studying this book are Visual Basic, ASP.NET, ASP.NET AJAX, LINQ, .NET, SQL Server, Web Services, Windows Presentation Foundation, Windows 7, UML, Code Search Engines and Code Sites, Game Programming and Programming Projects.

Acknowledgments

Thanks to Barbara Deitel for long hours devoted to this project—she created all of our Java and Android Resource Centers, and patiently researched hundreds of technical details. We’re fortunate to have worked with the dedicated team of publishing professionals at Pearson. We appreciate the guidance, savvy and energy of Tracy Johnson (Computer Science Executive Editor), Michael Hirsch (former Editor-in-Chief of Computer Science) and Marcia Horton (Vice President and Editorial Director, ECS). Carole Snyder and Bob Engelhardt have done a marvelous job managing the review and production processes, respectively.

Recent Editions Reviewers

We wish to acknowledge the efforts of our recent editions reviewers. Adhering to tight schedules, they scrutinized the text and the programs, providing countless suggestions for improving the accuracy and completeness of the presentation. **Microsoft reviewers:** Adrian “Spotty” Bowles (Microsoft Corporation), Marcelo Guerra Hahn (Microsoft Corporation), Huanhui Hu (Microsoft Corporation), Timothy Ng

(Microsoft Corporation), Akira Onishi (Microsoft Corporation), April Reagan (Microsoft Corporation), Steve Stein (Microsoft Corporation) and Scott Wisniewski (Microsoft Corporation). **Academic reviewers:** Dr. Douglas B. Bock (Southern Illinois University Edwardsville, and a Microsoft Certified Solution Developer for .NET technologies (MCSD.NET)), Dr. Laurence Boxer (Niagara University and SUNY at Buffalo), Edward Hunter (Chapman University College), Christopher J. Olson (Dakota State University) and Josh Pauli (Dakota State University). **Industry reviewers:** Jeff Certain (Colorado CustomWare, Inc.), Matthew Kleinwaks (Abby Rating Systems, Inc.; Microsoft Visual Basic MVP), Éric Moreau (Moer, Inc.; Microsoft Visual Basic MVP), José Antonio González Seco (Parliament of Andalusia), Rod Stephens (President, Rocky Mountain Computer Consulting, Inc.) and Chris Williams (Magenic; Microsoft Visual Basic MVP).

Well, there you have it! Visual Basic 2010 is a powerful programming language that will help you write programs quickly and effectively. It scales nicely into the realm of enterprise systems development to help organizations build their business-critical and mission-critical information systems. As you read the book, we would sincerely appreciate your comments, criticisms, corrections and suggestions for improving the text. Please address all correspondence to:

deitel@deitel.com

We'll respond promptly, and post corrections and clarifications on:

www.deitel.com/books/SimplyVB2010/

We hope you enjoy reading *Simply Visual Basic 2010, Fourth Edition* as much as we enjoyed writing it!

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About the Authors

Paul J. Deitel, CEO and Chief Technical Officer of Deitel & Associates, Inc., is a graduate of MIT, where he studied Information Technology. Through Deitel & Associates, Inc., he has delivered hundreds of Visual Basic, Java, C++, C, C# and Internet programming courses to industry clients, including Cisco, IBM, Siemens, Sun Microsystems (now Oracle), Dell, Lucent Technologies, Fidelity, NASA at the Kennedy Space Center, Digital Equipment Corporation (now Hewlett-Packard), the National Severe Storm Laboratory, White Sands Missile Range, Rogue Wave Software, Boeing, SunGard Higher Education, Stratus, Cambridge Technology Partners, One Wave, Hyperion Software, Adra Systems, Entergy, CableData Systems, Nortel Networks, Puma, iRobot, Invensys and many more. He and his co-author, Dr. Harvey M. Deitel, are the world's best-selling programming-language textbook authors.

Dr. Harvey M. Deitel, Chairman and Chief Strategy Officer of Deitel & Associates, Inc., has 50 years of experience in the computer field. Dr. Deitel earned B.S. and M.S. degrees from MIT and a Ph.D. from Boston University. He has extensive college teaching experience, including earning tenure and serving as the Chairman of the Computer Science Department at Boston College before founding Deitel & Associates, Inc., with his son, Paul J. Deitel. He and Paul are the co-authors of dozens of books and *LiveLessons* video packages and they are writing many more. The Deitels' texts have earned international recognition, with translations published in Japanese, German, Russian, Chinese, Spanish, Korean, French, Polish, Italian, Portuguese, Greek, Urdu and Turkish. Dr. Deitel has delivered hundreds of professional programming seminars to major corporations, academic institutions, government organizations and the military.

Abbey S. Deitel, President of Deitel & Associates, Inc., is a graduate of Carnegie Mellon University's Tepper School of Management where she received a B.S. in Industrial Management. Abbey has been managing the business operations of Deitel & Associates, Inc. for 14 years. She has contributed to numerous Deitel & Associates publications and is the co-author of *Internet & World Wide Web How to Program, 5/e*; *iPhone for Programmers: An App-Driven Approach*; *Android for Programmers: An App-Driven Approach* and *Android How to Program*.

**Corporate Training from
Deitel & Associates, Inc.**

Deitel & Associates, Inc., is an internationally recognized corporate training and authoring organization. The company provides instructor-led courses delivered at client sites worldwide on major programming languages and platforms, such as Visual Basic[®], Visual C#[®], Visual C++[®], Java[™], C, C++, XML[®], Python[®], object technology, Internet and web programming, Android[™] and iPhone[®] app development, and a growing list of additional programming and software-development courses. The founders of Deitel & Associates, Inc., are Paul J. Deitel and Dr. Harvey M. Deitel. The company's clients include many of the world's largest companies, government agencies, branches of the military, and academic institutions. Through its 36-year publishing partnership with Prentice Hall/Pearson, Deitel & Associates, Inc., publishes leading-edge programming textbooks, professional books and *LiveLessons* video courses. Deitel & Associates, Inc., and the authors can be reached via e-mail at:

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