



Introduction to Programming with

Visual Basic .NET

Gary J. Bronson
David Rosenthal

Preface iii

1 Introduction to Computers and Programming 1

1.1 Introduction to Programming 2

First-Generation and Second-Generation (Low-Level)
Languages 3

Third-Generation and Fourth-Generation (High-Level)
Languages 4

1.2 Problem Solution and Software Development 11

Phase I. Design and Development 12

Phase II. Documentation 13

Phase III. Maintenance 14

A Closer Look at Phase I 15

1.3 Introduction to Modularity 21

Procedural Code 22

1.4 Algorithms 24

1.5 Focus on Program Design and Implementation: The Rotech Case and Rapid Application Prototyping 29

Forms 30

Program Elements 33

	Systems Analysis and Design	34
	Rapid Application Prototyping	35
	Task Trigger List (TTL) Tables	36
	Programming Projects	37
1.6	Knowing About: Computer Hardware	38
	Hardware Evolution	40
	Bits and Bytes	41
	Words	41
1.7	Common Programming Errors and Problems	42
1.8	Chapter Review	43

2

	Introduction to Visual Basic .NET	45
2.1	Elements of a Visual Basic Application	46
	The Visual Element	46
	The Language Element	50
2.2	Getting Started in Visual Basic	51
	The IDE as a Windows Workspace	53
	Setting an Object's Properties	60
	Running an Application	64
	Saving and Recalling a Project	65
	Using the Toolbar	67
2.3	Adding an Event Procedure	68
	The MessageBox.Show Method	69
	Correcting Errors	77
2.4	Adding Controls	78
	Adding a Button	79
	Adding a TextBox Control	80
	Setting the Initial Object Properties	83
	Looking at the Focus and Tab Sequence	86
	The Format Menu Option	88
	The Label Control	89
2.5	Adding Additional Event Procedures	92
	Comments	97
	Statement of Categories	97
	A Closer Look at the TextBox Controls	98

- 2.6 **Focus on Program Design and Implementation: Creating a Main Menu** 101
 - Button Main Menus 101
 - Adding a Second Form 106
 - Displaying and Hiding Forms 108
- 2.7 **Knowing About: The Help Facility** 112
 - The Contents Tab 113
 - The Index Tab 114
 - The Search Tab 116
 - Dynamic Help 118
 - Context-Sensitive Help 119
- 2.8 **Common Programming Errors and Problems** 119
- 2.9 **Chapter Review** 120

3 Data and Operations 125

- 3.1 **Data Types, Arithmetic Operations, and Strings** 126
 - Integers 126
 - Floating Point Values 127
 - Exponential Notation 127
 - Booleans 128
 - Numeric Operations 128
 - Strings 130
 - Operator Precedence and Associativity 135
- 3.2 **Variables and Declaration Statements** 138
 - Declaration Statements 140
 - Single-line Declarations 143
 - Initialization 144
- 3.3 **Named Constants** 149
- 3.4 **Assignment Statements** 155
 - Assignment Variations 159
 - Accumulating 160
 - Counting 161
 - Type Conversions 163
- 3.5 **Using Intrinsic Functions** 167
- 3.6 **Focus on Program Design and Implementation: Creating an Operational Form** 171
 - Step 1: Add a New Stub Form to the Project 171

	Step 2: Link the New Stub Form to the Main Menu	173
	Adding the Event Code	178
	Areas of Programmer Concern	179
3.7	Knowing About: The Basics of Form Design	181
	1. General Design Considerations	182
	2. Label and Text Considerations	182
	3. Color Considerations	183
3.8	Common Programming Errors and Problems	183
3.9	Chapter Review	184

4

Controlling Input and Output 197

4.1	Interactive User Input	198
	The InputBox Intrinsic Function	199
	The TextBox Control Reconsidered	203
	A First Look at User-Input Validation	206
4.2	Formatted Output	211
	Formatting Functions	211
4.3	Printer Output	214
4.4	Focus on Program Design and Implementation: Formatting and Printer Output	217
4.5	Common Programming Errors and Problems	223
4.6	Chapter Review	223

5

Selection 231

5.1	Selection Controls	232
	The CheckBox Control	233
	The RadioButton Control	235
	The GroupBox Control	239
	The ListBox Control	240
5.2	Relational Expressions	244
	Logical Operators	246
	A Numerical Accuracy Problem	249
5.3	The If-Then-Else Structure	251
	One-Way Selection and the Single-line If-Then Statement	255
	Nested If Statements	259
	Input Data Validation	259

- 5.4 The If-Then-Else Structure 264
- 5.5 The Select Case Structure 275
- 5.6 Focus on Program Design and Implementation: Controlling Focus and On-the-Fly Data Validation 279
 - Focus Control 280
 - On-the-Fly Input Data Validation 283
- 5.7 Knowing About: Errors, Testing, and Debugging 284
 - Design-time and Run-time Errors 284
 - Syntax and Logic Errors 285
 - Testing and Debugging 286
- 5.8 Common Programming Errors and Problems 288
- 5.9 Chapter Review 289

6 Repetition Structures 301

- 6.1 Introduction 302
 - Pretest and Posttest Loops 302
 - Fixed Count Versus Variable Condition Loops 304
- 6.2 Do While Loops 304
- 6.3 Interactive Do While Loops 313
 - The Do Until Loop 320
 - Sentinels 321
 - Breaking Out of a Loop 323
- 6.4 For/Next Loops 326
 - For/Next Loop Rules 329
- 6.5 Nested Loops 336
- 6.6 Exit-Controlled Loops 343
 - The Do/Loop Until Structure 343
 - The Do/Loop While Structure 345
 - Validity Checks 345
- 6.7 Focus on Program Design and Implementation: After-the-Fact Data Validation and Creating Keyboard Shortcuts 349
 - Using Function Keys as Keyboard Shortcuts 357
- 6.8 Knowing About: Programming Costs 360
- 6.9 Common Programming Errors and Problems 363
- 6.10 Chapter Review 364

7

Sub and Function Procedures 373

- 7.1 Sub Procedures 375
 - Creating a General Sub Procedure 379
 - Exchanging Data with a General Procedure 379
 - A Practical Application Illustrating Input Data Validation 384
- 7.2 Passing Arguments By Value and By Reference 390
- 7.3 Function Procedures 397
 - Calling a Function Procedure 399
 - Creating Functions that Manipulate Strings 403
- 7.4 Variable Scope 408
 - Using Module-Level Variables 412
 - Static Variables 413
- 7.5 Recursion 416
 - Mathematical Recursion 416
 - How the Computation is Performed 419
 - Recursion Versus Iteration 421
- 7.6 Focus on Program Design and Implementation: A General Procedure Menu System 424
- 7.7 Knowing About Debugging 428
 - Breakpoints 430
 - Step-Over Execution 435
- 7.8 Common Programming Errors 435
- 7.9 Chapter Review 436

8

Structured Data 445

- 8.1 One-Dimensional Arrays 446
 - Where to Declare Arrays 448
 - Using Indexed Variables 449
 - Input and Output of Array Values 450
- 8.2 Additional Array Capabilities 458
 - Dynamic Arrays 458
 - Arrays as Arguments 459
 - Multidimensional Arrays 462
 - Passing Multidimensional Arrays 466
 - Arrays and Strings 467

- 8.3 Structures 470
- 8.4 Searching and Sorting 475
 - Search Algorithms 476
 - Big O Notion 481
 - Sort Algorithms 482
- 8.5 Focus on Program Design and Implementation: About Dialog Boxes and Splash Screens 489
 - Adding an About Dialog Box 489
 - Adding a Splash Screen 490
- 8.6 Common Programming Errors 497
- 8.7 Chapter Reviews 498

9 Accessing Databases 503

- 9.1 Introduction to Databases 504
 - Stored and Index Ordering 508
 - Structured Queries 508
- 9.2 Using ADO.NET with Visual Basic 510
 - Setting Up a Data Connection 511
 - Setting Up a Data Adapter 515
 - Creating a Dataset 518
 - Binding Data to Controls 521
 - Filling the Dataset 523
 - Navigating through the Dataset 523
 - Accessing Fields in a Dataset 528
- 9.3 Updating a Dataset 530
 - Initialization Code 531
 - Adding a Record 532
 - Deleting a Record 534
 - Editing a Record 536
- 9.4 Creating Datasets Using SQL 541
 - Finding Specific Data in a Dataset 543
 - Accessing All Records in a Dataset 544
 - DataGrid Control 545
 - Relationships Reconsidered 548
 - Creating Multitable Datasets 551
 - Run-time Structured Queries 554

- 9.5 Focus on Program Design and Implementation: Connecting to a Database 558
 - Connecting the Order-Entry Forms to a Database 561
 - Auditing 567
- 9.6 Common Programming Errors and Problems 574
- 9.7 Chapter Review 574

10

Processing Visual Basic Data Files 581

- 10.1 Introduction to Visual Basic's File Types 582
- 10.2 Sequential Access Files 584
 - Opening Sequential Files for Writing 584
 - Opening Sequential Files for Reading 585
 - Exception Handling 588
 - Closing a Sequential File 589
 - Writing to a Sequential File 589
 - Reading from a Sequential File 593
- 10.3 File Dialog Controls 598
 - OpenFileDialog and SaveFileDialog Controls 598
- 10.4 Random-Access Files 604
- 10.5 Binary-Access Files 614
- 10.6 Focus on Program Design and Implementation: Creating Screen and Printer Reports 618
 - Adding the New Report Form 619
 - Creating a Screen Report 623
 - Creating a Printed Report 626
- 10.7 Common Programming Errors 632
- 10.8 Chapter Review 633

11

Creating Web Applications with Visual Basic .NET 639

- 11.1 Client/Server and Web Applications 640
- 11.2 A Simple Web Application 642
- 11.3 A Multiform Web Application 647
 - Sharing Information Among Web Forms 647
 - Validating User Input 648
 - Adding a Second Web Form 652
 - Completing the Application 652

11.4	Using Databases with Web Applications	658
	Displaying Data from a Database on a Web Form	659
	Updating Data on a Web Form	664
	Using a DataGrid on a Web Form	670
11.5	Chapter Review	672

12

Introduction to Classes 677

12.1	Classes and Class Modules	679
	Abstract Data Types	679
	Class Construction	683
	Creating a Class Module	685
	Saving a Class Module	687
	Using a Class	688
	Terminology	691
12.2	Constructors	694
	Arrays of Objects	695
12.3	Access Procedures Set and Get	698
12.4	An Example: Constructing an Elevator Object	704
12.5	Knowing About: Inside and Outside	710
	Abstraction and Encapsulation	712
	Code Reuse and Extensibility	712
12.6	Common Programming Errors	713
12.7	Chapter Review	713
Appendix A	Supported ASCII Character Codes	719
Appendix B	Additional Controls	721
Appendix C	Glossary	735
Index		743