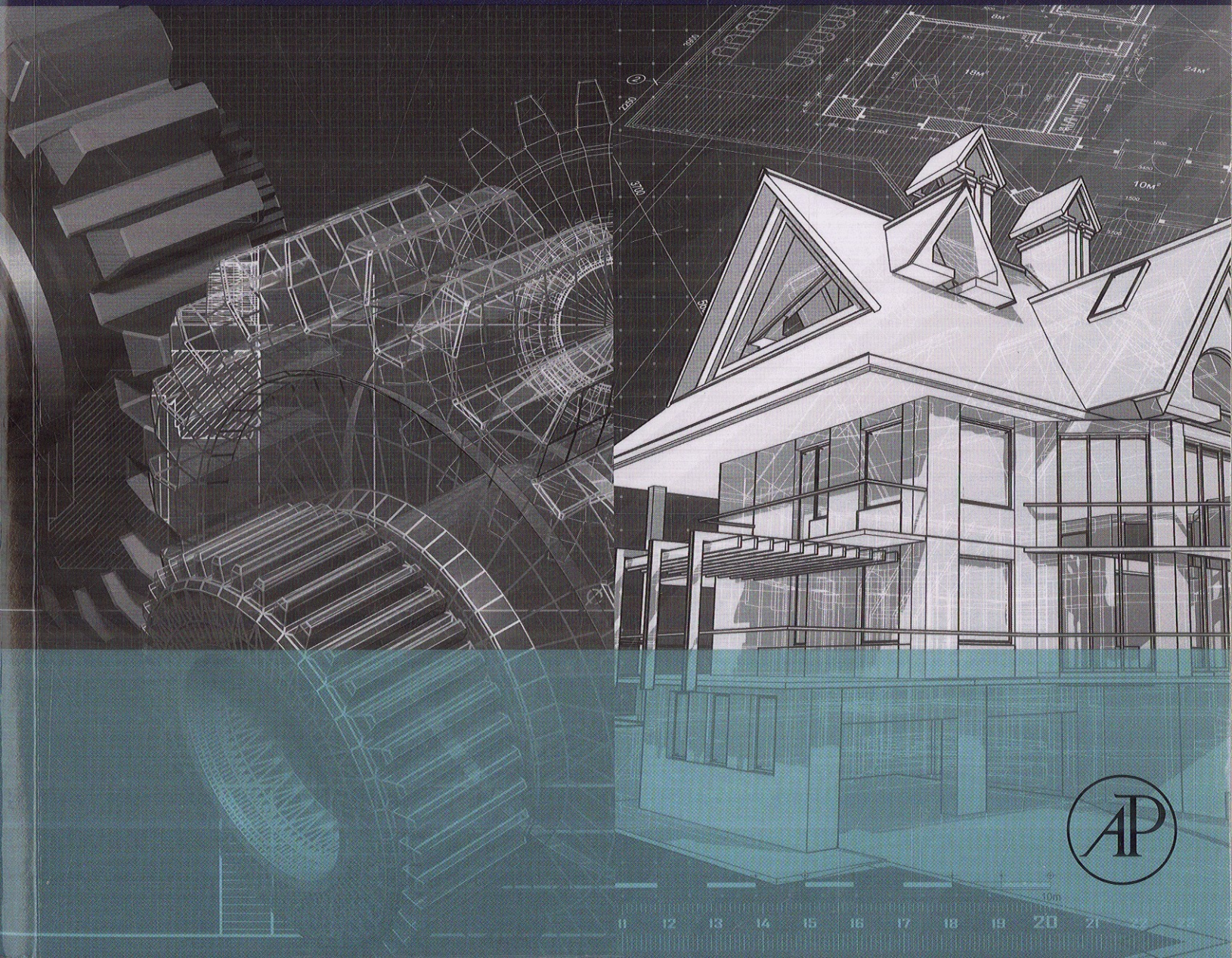


Up and Running with AutoCAD® 2011

2D and 3D Drawing
and Modeling

Elliot Gindis



ACKNOWLEDGMENTS	xvii
ABOUT THE AUTHOR	xix
PREFACE	xxi

LEVEL 1 • Chapters 1–10.....1

CHAPTER 1 AutoCAD Fundamentals—Part I.....3

1.1 Introduction and Basic Commands.....4

1.2 The AutoCAD Environment.....5

1.3 Interacting with AutoCAD.....8

Method 1: Type in the Commands on the Command Line 9

Method 2: Select the Commands from the Drop-Down Cascading Menus 9

Method 3: Use Toolbar Icons to Activate the Commands 10

Method 4: Use the Ribbon Tabs, Icons, and Menus 10

Methods 5 and 6: Use the Screen Side Menu and Use a Tablet..... 12

1.4 Practicing the Create Objects Commands13

Line 13

Circle 14

Arc..... 15

Rectangle..... 16

1.5 View Objects.....19

Zoom 19

Pan 19

Regen 19

1.6 Practicing the Edit/Modify Objects Commands21

Erase 21

Move..... 21

Copy 22

Rotate..... 23

Scale 23

Trim 24

Extend 25

Offset 27

Mirror..... 28

Fillet 29

1.7 Selection Methods30

1.8 Drawing Accuracy—Part 1.....30

Ortho (F8)..... 30

1.9 Drawing Accuracy—Part 2.....31

OSNAPs 31

ENDpoint..... 31

MIDpoint 31

CENTER 31

QUADrant 32

INTERsection 32

PERPendicular 32

1.10 OSNAP Drafting Settings.....33

Summary.....34

CHAPTER 2	AutoCAD Fundamentals—Part II.....	39
2.1 Grips		40
2.2 Units and Scale		40
2.3 Snap and Grid		42
2.4 Cartesian Coordinate System		43
2.5 Distance Entry Techniques		44
Direct Distance and Angle Entry		44
Relative Distance and Angle Entry		45
Other Uses of DYN.....		47
2.6 Inquiry Commands		48
Area.....		48
Distance		49
List.....		50
ID		51
2.7 Miscellaneous Topics		52
Explode.....		52
Polygon.....		52
Ellipse.....		54
Chamfer.....		55
Templates		56
Limits		56
Save		57
Help Files.....		58
Summary.....		60
CHAPTER 3	Layers, Colors, Linetypes, and Properties	67
3.1 Introduction to Layers		68
What Are Layers?.....		68
Why Use Them?.....		68
Creating and Deleting Layers		69
Making a Layer Current		69
Assigning Layer Colors		70
Layer Freeze/Thaw and On/Off.....		72
Layer Lock/Unlock		72
3.2 Introduction to Linetypes		72
3.3 Introduction to Properties		74
Properties Palette		74
Match Properties		75
Layers Toolbar		76
3.4 In Class Drawing Project: Floor Plan Layout		77
Basic File Preparation		77
Starting the Floor Plan.....		77
Drawing the Inner Wall Geometry.....		79
Drawing the Rest of the Inner Walls		81
Summary.....		83
SPOTLIGHT ON: ARCHITECTURE		89
CHAPTER 4	Text, Mtext, Editing, and Style	95
4.1 Introduction to Text and Mtext.....		96
4.2 Text		96
Editing Text.....		97
4.3 Mtext.....		98
Formatting Mtext.....		99
4.4 Style		103

4.5 Spell Check	104
4.6 In Class Drawing Project: Adding Text and Furniture to Floor Plan Layout	106
Summary.....	109
Tips	109
CHAPTER 5 Hatch Patterns	113
5.1 Introduction to Hatch	114
5.2 Hatch Procedures	115
Step 1. Pick the Hatch Pattern You Want to Use	115
Step 2. Indicate Where You Want the Pattern to Go	117
Step 3. "Fine-Tune" the Pattern by Adjusting Scale and Angle (if Necessary)	118
Step 4. Preview the Pattern and Accept It if OK	119
5.3 Working with Hatch Patterns.....	119
Exploding Hatch Patterns	121
Hatch Pattern Layers and Colors	121
Advanced Hatch Topics.....	121
5.4 Gradient and Solid Fill	123
Solid Fill	123
5.5 In Class Drawing Project: Adding Hatch to Floor Plan Layout	126
Summary.....	127
CHAPTER 6 Dimensions.....	131
6.1 Introduction to Dimensions	132
6.2 Types of Dimensions	132
Linear Dimensions	133
Aligned Dimension	134
Diameter Dimension	135
Radius Dimension.....	136
Angular Dimension	137
Continuous Dimensions	138
Baseline Dimensions	139
Leader and Multileader.....	141
Secondary Dimensions.....	145
6.3 Editing Dimensions	145
6.4 Customizing Dimensions	147
ddim	148
6.5 In Class Drawing Project: Adding Dimensions to Floor Plan Layout	152
Summary.....	153
CHAPTER 7 Blocks, Wblocks, Dynamic Blocks, and Purge	157
7.1 Introduction to Blocks	158
Difference between Blocks and Wblocks	158
Creating a Block	158
7.2 Insert	161
7.3 Purge	162
7.4 Wblocks	164
Inserting Wblocks	164
7.5 Dynamic Bblocks	164
Summary.....	169
SPOTLIGHT ON: MECHANICAL ENGINEERING.....	171
CHAPTER 8 Polar and Rectangular Arrays	175
8.1 Polar Array.....	176
Steps in Creating a Polar Array	176

8.2 Rectangular Array	178
Steps in Creating a Rectangular Array.....	178
8.3 In Class Drawing Project: Mechanical Device	179
8.4 Drawing a Star	184
Summary	184
 CHAPTER 9 Basic Printing and Output	187
9.1 Introduction to Printing and Plotting	188
9.2 The Essentials	188
What Printer or Plotter to Use	188
What Paper Size to Use.....	189
What Area to Plot.....	189
At What Scale to Plot	190
What Pen Settings to Use.....	190
What Orientation to Use	191
What Offset to Use	191
Miscellaneous	191
9.3 The Plot Dialog Box	191
Preview	193
9.4 Page Setup Manager	195
Summary	196
 CHAPTER 10 Advanced Output—Paper Space	199
10.1 Introduction to Paper Space	200
What Is Paper Space?.....	200
10.2 Paper Space Concepts	201
Layouts.....	201
Viewports.....	207
Scaling	210
Layers	214
Text and dims.....	217
Annotation	220
Summary	222
Summary	223
 LEVEL 2 • Chapters 11–20	227
 CHAPTER 11 Advanced Linework	229
11.1 Introduction to Advanced Linework	229
11.2 Pline (Polyline)	230
Pedit.....	231
Exploding a Pline	232
Additional Pline Options	232
11.3 Xline (Construction Line)	235
11.4 Ray	236
11.5 Spline	237
11.6 Mline (Multiline)	239
Modifying the Mline.....	240
Mlstyle (Multiline Style)	240
Mledit (Multiline Edit).....	244
Other Mline Properties	245
11.7 Sketch	246
Applications of Sketch.....	246
Level 2 Drawing Project (1 of 10): Architectural Floor Plan	248
Summary	250

CHAPTER 12	Advanced Layers	253
12.1	Introduction to Advanced Layers	254
12.2	Script Files	254
12.3	Layer State Manager	255
12.4	Layer Filtering	259
	Level 2 Drawing Project (2 of 10): Architectural Floor Plan	261
	Summary	265

CHAPTER 13	Advanced Dimensions	267
13.1	Introduction to Advanced Dimensions	268
13.2	Dimension Style Manager	268
	Lines Tab	269
	Symbols and Arrows Tab	269
	Text Tab	270
	Fit Tab	271
	Primary Units Tab	272
	Alternate Units Tab	273
	Tolerances Tab	274
13.3	Introduction to Constraints	276
13.4	Geometric Constraints	276
	Types of Geometric Constraints	277
	Adding Geometric Constraints	277
	Hiding, Showing, and Deleting Geometric Constraints	279
13.5	Dimensional Constraints	280
	Working with Dimensional Constraints	281
13.6	Dimension Driven Design	283
	Level 2 Drawing Project (3 of 10): Architectural Floor Plan	284
	Summary	286

SPOTLIGHT ON: INTERIOR DESIGN289

CHAPTER 14	Options, Shortcuts, CUI, Design Center, and Express Tools	293
14.1	Options	294
	Files Tab	294
	Display Tab	296
	Open and Save Tab	298
	Plot and Publish Tab	300
	System Tab	302
	User Preferences Tab	303
	Drafting Tab	305
	3D Modeling Tab	306
	Selection Tab	307
	Profiles Tab	308
14.2	Shortcuts	309
	PGP File	310
	Altering the pgp File	310
14.3	Customize User Interface	312
14.4	Design Center	315
14.5	Express Tools	318
	Blocks	319
	Text	319
	Layout Tools, Dimensions, and Selection Tools	321
	Modify	321
	Draw	321

File Tools, Web Tools, and Tools	322
Layer Express Tools	322
Level 2 Drawing Project (4 of 10): Architectural Floor Plan	324
Summary.....	326
 CHAPTER 15 Advanced Design and File Management Tools	329
15.1 Introduction to Advanced Design and File Management Tools	330
15.2 Align.....	330
15.3 Audit and Recover.....	332
15.4 Break and Join	333
Break, Method 1	333
Break, Method 2	334
Join	335
15.5 Cad Standards	335
15.6 Calculator.....	336
15.7 Defpoints Concept	339
15.8 Divide and Point Style	339
15.9 Donut	340
15.10 Draw Order	340
15.11 eTransmit	341
15.12 Filters	343
15.13 Hyperlinks	344
15.14 Lengthen	346
15.15 Object Snap Tracking	347
15.16 Overkill.....	347
15.17 Point	348
15.18 Publish	349
15.19 Raster	350
15.20 Revcloud	350
15.21 Sheet Sets	351
15.22 Selection Methods.....	353
15.23 Stretch.....	356
15.24 System Variables	357
15.25 Tables	358
15.26 Tool Palette	360
15.27 Ucs and Crosshair Rotation	362
15.28 Window Tiling.....	363
15.29 Wipeout.....	363
Level 2 Drawing Project (5 of 10): Architectural Floor Plan	368
Summary.....	370
 CHAPTER 16 Importing and Exporting Data	373
16.1 Introduction to Importing and Exporting Data.....	373
16.2 Importing and Exporting To and from MS Office Applications	374
Word into AutoCAD.....	374
AutoCAD into Word.....	375
Excel into AutoCAD	375
AutoCAD into Excel	376
PowerPoint into AutoCAD	377
AutoCAD into PowerPoint	377
16.3 Screen Shots	377
16.4 JPGs	377
16.5 PDFs	378
16.6 Other CAD Software	380
16.7 Exporting and the save as Feature.....	381

16.8 Inserting and OLE 383

Level 2 Drawing Project (6 of 10): Architectural Floor Plan 385

Summary..... 386

CHAPTER 17 External References (XREFs)..... 387

17.1 Introduction to Xrefs 388

17.2 Using Xrefs..... 389

17.3 Layers in Xrefs..... 392

17.4 Editing and Reloading Xrefs..... 393

17.5 Multiple Xrefs 394

17.6 Ribbon and Xrefs 395

Level 2 Drawing Project (7 of 10): Architectural Floor Plan 396

Summary..... 398

SPOTLIGHT ON: ELECTRICAL ENGINEERING 401

CHAPTER 18 Attributes 405

18.1 Introduction to Attributes..... 405

18.2 Creating the Design 406

18.3 Creating the Attribute Definitions 407

18.4 Creating the Attribute Block 409

18.5 Attribute Properties and Editing 410

18.6 Attribute Extraction 411

18.7 Invisible Attributes..... 416

Level 2 Drawing Project (8 of 10): Architectural Floor Plan 417

Summary..... 418

CHAPTER 19 Advanced Output and Pen Settings 421

19.1 Introduction to Advanced Output and Pen Settings 422

19.2 Setting Standards 422

19.3 The CTB File..... 423

19.4 Additional CTB file Features 427

19.5 The LWT option..... 428

Level 2 Drawing Project (9 of 10): Architectural Floor Plan 429

Summary..... 430

CHAPTER 20 Isometric Drawing 433

20.1 Introduction to Isometric Perspective 434

 Why Use Isometric Perspective Instead of 3D? 434

 When **Not** to use Isometric Perspective 434

20.2 Basic Technique 434

20.3 Ellipses in Isometric Drawing..... 437

20.4 Text and Dimensions in Isometric Drawing 438

Level 2 Drawing Project (10 of 10): Architectural Floor Plan 439

Summary..... 439

LEVEL 3 • Chapters 21–30..... 441

CHAPTER 21 3D Basics 445

21.1 Axes, Planes, and Faces..... 445

21.2 3D Workspaces, Ribbon, Toolbars, and 3D Options 447

21.3 Entering and Exiting 3D 449

21.4 Projecting into 3D..... 451

21.5 3D Dynamic Views 456

21.6 Extrude 457

21.7 Visual Styles: Hide and Shade	458
21.8 Navigation Cube	459
Summary.....	462
CHAPTER 22 Primitives	465
22.1 Introduction to Primitives.....	466
Box.....	466
Wedge	467
Cone	467
Sphere.....	468
Cylinder	469
Torus	469
Pyramid	470
22.2 Applying Primitives	471
Summary.....	472
CHAPTER 23 Object Manipulation	473
23.1 Introduction to Object Manipulation.....	474
Rotate3D	474
3Drotate (gizmo).....	475
Mirror3D	478
3Darray.....	480
3Dscale	483
3Dmove	484
Fillet and Chamfers in 3D	485
Summary.....	488
SPOTLIGHT ON: AEROSPACE ENGINEERING	489
CHAPTER 24 Boolean Operations	495
24.1 Introduction to Boolean Operations	495
Union.....	496
Subtract.....	497
Intersect	499
Drawing Project: 3D Building Wall with Door and Window.....	500
Summary.....	503
CHAPTER 25 Solid Modeling	505
25.1 Introduction to Solid Modeling.....	506
Revolve.....	506
Shell.....	510
Taper	512
Drawing Project: Wastebasket.....	514
Loft	516
Drawing Project: Mechanical Drill Bit	520
Path Extrusion	521
Sweep	524
Drawing Challenge: Helical Coil.....	525
Summary.....	526
CHAPTER 26 Advanced Solids, Faces, and Edges	531
26.1 Introduction to Advanced Solids, Faces, and Edges	532
Polysolid	532
Helix.....	534
3DAlign.....	535

26.2 Working with Faces	537
Delete Faces	538
Move Faces	539
Copy Faces	540
Offset Faces	540
Rotate Faces	541
Color Faces	543
26.3 Working with Edges	544
Color Edges	544
Copy Edges	544
Summary	547
CHAPTER 27 Surfaces and Meshes	549
27.1 Introduction to Surfaces and Meshes	550
27.2 Legacy Commands	550
Planar Surface	550
Region	552
Rulesurf	552
Tabsurf	554
Revsurf	556
Edgesurf	557
3Dface and 3Dmesh	558
27.3 New Commands	560
Smooth Mesh Primitives	560
Mesh Modification 1: Smoothness	562
Mesh Modification 2: Filters and Gizmos	562
Mesh Modification 3: Additional Tools	564
Summary	565
SPOTLIGHT ON: CIVIL ENGINEERING	565
CHAPTER 28 UCS, Vports, Text, and Dimensions in 3D	571
28.1 Introduction to UCS, Vports, Text, and Dimensions in 3D	572
28.2 Advanced UCS	573
UCS	574
World	574
UCS Previous	574
Face UCS	575
Object	575
View	576
Origin	576
Z-Axis Vector	577
3 Point	577
X, Y, and Z	579
Named UCS	579
28.3 Views and View Manager	580
28.4 Vports	582
28.5 Text and Dimensions in 3D	585
Summary	588
CHAPTER 29 Dview, Walk and Fly, Animation, and Action Recording	593
29.1 Dynamic View	594
Camera	595
Target	595
Distance	595

PPoints	596
PAn.....	597
Zoom.....	597
Twist.....	597
CLip.....	597
Hide	598
Off.....	598
Undo	598
29.2 Cameras.....	599
29.3 Walk and Fly.....	601
29.4 Path Animation.....	606
29.5 Action Recording.....	609
Summary.....	611
CHAPTER 30 Lighting and Rendering	613
30.1 Introduction to Lighting and Rendering.....	614
30.2 Lighting.....	614
Point Light.....	615
Spotlight	618
Distant Light	619
Shadows, Sun, and Sky	621
30.3 Materials and Rendering	625
Materials	625
Rendering	628
Summary.....	630
Appendices	633
APPENDIX A Additional Information on AutoCAD.....	635
Additional Information on AutoCAD	635
Who Makes AutoCAD?.....	635
What is AutoCAD It?.....	635
How is AutoCAD Purchased and How Much Does it Cost?.....	636
Are there Significant Differences Between AutoCAD Releases?.....	636
A Brief History of Autodesk and AutoCAD	637
AutoCAD Releases	638
Major Autodesk Products.....	639
AutoCAD Related Websites.....	639
APPENDIX B Other CAD Software and Design and Analysis Tools and Concepts.....	643
MicroStation (www.Bentley.com).....	643
ArchiCAD (www.graphisoft.com).....	643
TurboCAD (www.turbocad.com)	644
CATIA (www.3ds.com).....	645
NX (www.ugs.com).....	645
Pro/Engineer (www.ptc.com)	645
SolidWorks (www.solidworks.com).....	646
Inventor (www.autodesk.com)	646
IronCAD (www.ironcad.com).....	646
Solid Edge (www.solidedge.com)	646
NASTRAN (www.NEINastran.com).....	646
ANSYS (www.ansys.com)	646
ALGOR (www.algor.com).....	646
Fluent (www.Fluent.com)	646

APPENDIX C	File Extensions	647
	AutoCAD Primary Extensions	647
	AutoCAD Secondary Extensions	647
	Miscellaneous Software Extensions	648
APPENDIX D	Custom Linetypes and Hatch Patterns	649
	Linetype Definitions (Basic)	649
	Linetypes (String Complex and Shape Complex)	650
	Hatch Pattern Definitions (Basic)	651
APPENDIX E	Principles of CAD Management	653
	PART 1: Know the Seven Golden Rules of AutoCAD	653
	PART 2: Know the Capabilities and Limitations of AutoCAD	654
	Capabilities	655
	Limitations	656
	PART 3: Maintain an Office Cad Standard	656
	PART 4: Be an Effective Teacher and Hiring Manager	657
	PART 5: Stay Current and Competent	658
APPENDIX F	AutoLISP Basics and Advanced Customization Tools	661
	Overview I: AutoLISP	661
	Overview II: Visual LISP	661
	Overview III: VBA, .NET, Active X, and ObjectARX	662
	AutoLISP Fundamentals	662
APPENDIX G	PC Hardware, Printers and Plotters, and Networks	667
	PC Hardware	667
	Printers and Plotters	668
	Networks	669
APPENDIX H	What Are Kernels?	671
APPENDIX I	Lighting, Rendering, Effects, and Animation	673
APPENDIX J	AutoCAD Certification Exams	675
APPENDIX K	AutoCAD Employment	677
APPENDIX L	AutoCAD Humor, Oddities, Quirks and Easter Eggs	679
	The AutoCAD Monkey Joke That Never Goes Away	680
	Oddities and Quirks	680
	Easter Eggs	681
INDEX		683