

AutoCAD 2017

for Engineers and Designers,

Basic and Intermediate

(23rd Edition)

CADCIM Technologies

*525 St. Andrews Drive
Schererville, IN 46375, USA
(www.cadcim.com)*

Contributing Author

Sham Tickoo

*Professor
Department of Mechanical Engineering Technology
Purdue University Northwest
Hammond, Indiana, USA*

*President & Founder : Tickoo Institute of
Emerging Technologies (TIET), India*

DEDICATION

*To teachers, who make it possible to disseminate knowledge
to enlighten the young and curious minds
of our future generations*

*To students, who are dedicated to learning new technologies
and making the world a better place to live in*

SPECIAL RECOGNITION

*A special thanks to Mr. Denis Cadu and the ADN team of Autodesk Inc.
for their valuable support and professional guidance to
procure the software for writing this textbook*

THANKS

*To the faculty and students of the MET department of
Purdue University Northwest for their cooperation*

To employees of CADCIM Technologies for their valuable help

Online Training Program Offered by CADCIM Technologies

CADCIM Technologies provides effective and affordable virtual online training on various software packages including Computer Aided Design and Manufacturing (CAD/CAM), computer programming languages, animation, architecture, and GIS. The training is delivered 'live' via Internet at any time, any place, and at any pace to individuals as well as the students of colleges, universities, and CAD/CAM training centers. The main features of this program are:

Training for Students and Companies in a Classroom Setting

Highly experienced instructors and qualified engineers at CADCIM Technologies conduct the classes under the guidance of Prof. Sham Tickoo of Purdue University Calumet, USA. This team has authored several textbooks that are rated "one of the best" in their categories and are used in various colleges, universities, and training centers in North America, Europe, and in other parts of the world.

Training for Individuals

CADCIM Technologies with its cost effective and time saving initiative strives to deliver the training in the comfort of your home or work place, thereby relieving you from the hassles of traveling to training centers.

Training Offered on Software Packages

CADCIM provides basic and advanced training on the following software packages:

CAD/CAM/CAE: CATIA, Pro/ENGINEER Wildfire, PTC Creo Parametric, Creo Direct, SOLIDWORKS, Autodesk Inventor, Solid Edge, NX, AutoCAD, AutoCAD LT, AutoCAD Plant 3D, Customizing AutoCAD, EdgeCAM, and ANSYS

Architecture and GIS: Autodesk Revit Architecture, AutoCAD Civil 3D, Autodesk Revit Structure, AutoCAD Map 3D, Revit MEP, Navisworks, Primavera, and Bentley STAAD Pro

Animation and Styling: Autodesk 3ds Max, Autodesk 3ds Max Design, Autodesk Maya, Autodesk Alias, The Foundry NukeX, MAXON CINEMA 4D, Adobe Flash, and Adobe Premiere

Computer Programming: C++, VB.NET, Oracle, AJAX, and Java

For more information, please visit the following link: <http://www.cadcim.com>

Note

If you are a faculty member, you can register by clicking on the following link to access the teaching resources: <http://www.cadcim.com/Registration.aspx>. The student resources are available at <http://www.cadcim.com>. We also provide **Live Virtual Online Training** on various software packages. For more information, write us at sales@cadcim.com.

Table of Contents

Dedication	iii
Preface	xxi

Chapter 1: Introduction to AutoCAD

AutoCAD Screen Components	1-2
Start Tab	1-2
Drawing Area	1-2
Command Window	1-2
Navigation Bar	1-5
ViewCube	1-6
In-canvas Viewport Controls	1-6
Status Bar	1-6
Invoking Tools in AutoCAD	1-10
Keyboard	1-10
Ribbon	1-11
Application Menu	1-12
Tool Palettes	1-13
Menu Bar	1-13
Toolbar	1-13
Shortcut Menu	1-13
File Tabs	1-14
AutoCAD Dialog Boxes	1-17
Starting a New Drawing	1-18
Open a Drawing	1-19
Start from Scratch	1-20
Use a Template	1-20
Use a Wizard	1-20
Saving Your Work	1-25
Save Drawing As Dialog Box	1-26
Automatic Timed Save	1-28
Creating Backup Files	1-28
Changing Automatic Timed Saved and Backup Files into AutoCAD Format	1-28
Using the Drawing Recovery Manager to Recover Files	1-29
Closing a Drawing	1-29
Opening an Existing Drawing	1-30

Opening an Existing Drawing Using the Select File Dialog Box	1-30
Opening an Existing Drawing Using the Startup Dialog Box	1-33
Opening an Existing Drawing Using the Drag and Drop Method	1-33
Quitting AutoCAD	1-34
Creating and Managing Workspaces	1-34
Creating a New Workspace	1-34
Modifying the Workspace Settings	1-34
AutoCAD Help <i>Enhanced</i>	1-35
Autodesk Cloud <i>Enhanced</i>	1-37
Autodesk Exchange Apps	1-39
Design Feed	1-41
BIM 360	1-45
Additional Help Resources	1-45
Self-Evaluation Test	1-45
Review Questions	1-46

Chapter 2: Getting Started with AutoCAD

Dynamic Input Mode	2-2
Enable Pointer Input	2-2
Enable Dimension Input where possible	2-3
Show command prompting and command input near the crosshairs	2-4
Show additional tips with command prompting	2-5
Drafting Tooltip Appearance	2-5
Drawing Lines in AutoCAD	2-6
The Close Option	2-7
The Undo Option	2-8
Invoking Tools Using Dynamic INPUT/Command Prompt	2-8
Coordinate Systems	2-8
Absolute Coordinate System	2-9
Relative Coordinate System	2-12
Relative Polar Coordinates	2-15
Direct Distance Entry	2-18
Erasing Objects	2-20
Canceling and Undoing Operation	2-21
Object Selection Methods	2-21
Window Selection Method	2-21
Crossing Selection Method	2-22
Lasso Selection Method	2-23
Drawing a Circle	2-24
Basic Display Commands	2-28
Zooming Drawings	2-28
Setting Units Type and Precision	2-29
Specifying the Format	2-30
Specifying the Angle Format	2-30
Setting the Direction for Angle Measurement	2-31
Specifying Units for the Drawing or the Block to be Inserted	2-32
Sample Output	2-32

Specifying Units for Lighting	2-32
Setting the Limits of a Drawing	2-34
Setting Limits	2-35
Limits for Architectural Drawings	2-35
Limits for Metric Drawings	2-37
Introduction to Plotting Drawings	2-38
Modifying AutoCAD Settings by Using the Options Dialog Box	2-40
Self-Evaluation Test	2-44
Review Questions	2-45

Chapter 3: Getting Started with Advanced Sketching

Drawing Arcs	3-2
Drawing Rectangles	3-10
Drawing Ellipses	3-14
Drawing Regular Polygons	3-18
Drawing Polylines	3-20
Drawing Donuts	3-25
Placing Points	3-26
Changing the Point Style and Size	3-26
Placing Multiple Points	3-27
Placing Points at Equal Distance	3-28
Placing Points at Specified Intervals	3-28
Drawing an Infinite Line	3-28
Drawing Construction Lines	3-28
Drawing Ray	3-31
Writing a Single Line Text	3-31
Self-Evaluation Test	3-32
Review Questions	3-32

Chapter 4: Working with Drawing Aids

Introduction	4-2
Understanding the Concept and Use of Layers	4-2
Working with Layers	4-3
Creating New Layers	4-4
Making a Layer Current	4-4
Controlling the Display of Layers	4-5
Arranging Layers in Increasing Order	4-9
Arranging Layers in Increasing Order with Respect to First Digit	4-10
Merging Layers	4-11
Deleting Layers	4-12
Managing the Display of Columns	4-12
Selective Display of Layers	4-13
Layer States	4-15
Reconciling New Layers	4-16
Isolating and Unisolating Layers	4-16
Controlling the Layer Settings	4-17

Object Properties	4-22
Changing the Color	4-22
Changing the Linetype	4-22
Changing the Lineweight	4-23
Changing the Plot Style	4-24
Changing Object Properties using the Properties Palette	4-24
Changing Object Properties using the Quick Properties Palette	4-25
Global and Current Linetype Scaling	4-26
LTSCALE Factor for Plotting	4-26
Changing the Linetype Scale Using the Properties Palette	4-27
Working with the DesignCenter	4-27
Drafting Settings Dialog Box	4-28
Setting Grid	4-29
Setting Snap	4-30
Snap Type	4-30
Drawing Straight Lines Using the Ortho Mode	4-31
Working with Object Snaps	4-32
Running Object Snap Mode	4-44
Overriding the Running Snap	4-45
Cycling through Snaps	4-45
Setting the Priority for Coordinate Entry	4-46
Using AutoTracking	4-47
Object Snap Tracking	4-47
Polar Tracking	4-48
AutoTrack Settings	4-48
Function and Control Keys	4-49
Self-Evaluation Test	4-49
Review Questions	4-50

Chapter 5: Editing Sketched Objects-I

Creating a Selection Set	5-2
Editing Sketches	5-7
Moving Sketched Objects	5-7
Copying Sketched Objects	5-8
Creating Multiple Copies	5-9
Creating an Array of Selected Objects	5-9
Creating a Single Copy	5-10
Pasting Contents from the Clipboard	5-11
Pasting Contents Using the Original Coordinates	5-11
Offsetting Sketched Objects	5-11
Through Option	5-12
Erase Option	5-12
Layer Option	5-13
Rotating Sketched Objects	5-13
Scaling the Sketched Objects	5-15
Filleting the Sketches	5-17
Chamfering the Sketches	5-20

Blending the Curves	5-23
Trimming the Sketched Objects	5-25
Extending the Sketched Objects	5-28
Stretching the Sketched Objects	5-30
Lengthening the Sketched Objects	5-31
Arraying the Sketched Objects	5-33
Rectangular Array	5-33
Polar Array	5-40
Path Array	5-46
Mirroring the Sketched Objects	5-48
Text Mirroring	5-49
Breaking the Sketched Objects	5-50
Placing Points at Specified Intervals	5-51
Dividing the Sketched Objects	5-53
Joining the Sketched Objects	5-54
Self-Evaluation Test	5-58
Review Questions	5-59

Chapter 6: Editing Sketched Objects-II

Introduction to Grips	6-2
Types of Grips	6-2
Adjusting Grip Settings	6-3
Editing Objects by Using Grips	6-5
Stretching the Objects by Using Grips (Stretch Mode)	6-5
Moving the Objects by Using Grips (Move Mode)	6-7
Rotating the Objects by Using Grips (Rotate Mode)	6-7
Scaling the Objects by Using Grips (Scale Mode)	6-9
Mirroring the Objects by Using Grips (Mirror Mode)	6-10
Editing a Polyline by Using Grips	6-11
Loading Hyperlinks	6-13
Editing Grippled Objects	6-13
Changing the Properties Using the Properties Palette	6-14
Matching the Properties of Sketched Objects	6-14
Quick Selection of Sketched Objects	6-15
Cycling Through Selection	6-17
Managing Contents Using the DesignCenter	6-18
Folders Tab	6-19
Open Drawings Tab	6-20
History Tab	6-20
Autodesk Seek design content Link	6-20
Making Inquiries About Objects and Drawings	6-23
Measuring Area of Objects	6-23
Measuring the Distance between Two Points	6-26
Identifying the Location of a Point	6-27
Listing Information about Objects	6-27
Listing Information about all Objects in a Drawing	6-28
Checking Time-Related Information	6-28

Obtaining Drawing Status Information	6-29
Displaying Drawing Properties	6-30
Basic Display Options	6-30
Redrawing the Screen	6-31
Regenerating Drawings	6-31
Zooming Drawings	6-32
Panning Drawings	6-39
Creating Views	6-41
Understanding the Concept of Sheet Sets	6-44
Creating a Sheet Set	6-44
Adding a Subset to a Sheet Set	6-48
Adding Sheets to a Sheet Set or a Subset	6-49
Archiving a Sheet Set	6-49
Resaving all Sheets in a Sheet Set	6-51
Placing Views on a Sheet of a Sheet Set	6-51
Self-Evaluation Test	6-52
Review Questions	6-53

Chapter 7: Creating Texts and Tables

Annotative Objects	7-2
Annotation Scale	7-2
Assigning Annotative Property and Annotation Scales	7-2
Customizing Annotation Scale	7-3
Multiple Annotation Scales	7-3
Assigning Multiple Annotation Scales Manually	7-3
Assigning Multiple Annotation Scales Automatically	7-4
Controlling the Display of Annotative Objects	7-5
Creating Text	7-6
Writing Single Line Text	7-6
Entering Special Characters	7-11
Creating Multiline Text	7-12
Editing Text	7-29
Editing Text Using the DDEDIT Command	7-29
Editing Text Using the Properties Palette	7-29
Modifying the Scale of the Text	7-30
Aligning Text	7-31
Inserting Table in the Drawing	7-32
Creating a New Table Style	7-37
Setting a Table Style As Current	7-41
Modifying a Table Style	7-41
Modifying Tables	7-41
Creating Text Styles	7-48
Creating Annotative Text	7-49
Checking Spelling	7-50
Text Quality and Text Fill	7-51
Finding and Replacing Text	7-52
Creating Title Sheet Table in a Sheet Set	7-53

Enhanced

Self-Evaluation Test	7-55
Review Questions	7-56

Chapter 8: Basic Dimensioning, Geometric Dimensioning, and Tolerancing

Need for Dimensioning	8-2
Dimensioning in AutoCAD	8-2
Fundamental Dimensioning Terms	8-3
Dimension Line	8-3
Dimension Text	8-3
Arrowheads	8-3
Extension Lines	8-4
Leader	8-4
Center Mark and Centerlines	8-5
Alternate Units	8-5
Tolerances	8-5
Limits	8-6
Associative Dimensions	8-6
Definition Points	8-7
Annotative Dimensions	8-8
Selecting Dimensioning Tools	8-8
Dimensioning a Number of Objects Together	8-9
Creating Linear Dimensions	8-10
Creating Aligned Dimensions	8-14
Creating Arc Length Dimensions	8-15
Creating Rotated Dimensions	8-16
Creating Baseline Dimensions	8-17
Creating Continued Dimensions	8-18
Creating Angular Dimensions	8-20
Creating Diameter Dimensions	8-23
Creating Jogged Dimensions	8-23
Creating Radius Dimensions	8-24
Creating Jogged Linear Dimensions	8-25
Generating Center Marks and Centerlines	8-25
Creating Associative Centermarks	8-26
Creating Associative Centerlines	8-27
Creating Ordinate Dimensions	8-28
Maintaining Equal Spacing between Dimensions	8-29
Creating Dimension Breaks	8-30
Creating Inspection Dimensions	8-32
Working with True Associative Dimensions	8-33
Removing the Dimension Associativity	8-34
Converting a Dimension into a True Associative Dimension	8-34
Drawing Leaders	8-35
Multileaders	8-39
Drawing Multileaders	8-40

Adding Leaders to Existing Multileader	8-42
Removing Leaders from Existing Multileader	8-42
Aligning Multileaders	8-42
Collecting Multiple Leaders	8-46
Geometric Dimensioning and Tolerancing	8-47
Geometric Characteristics and Symbols	8-48
Adding Geometric Tolerance	8-48
Complex Feature Control Frames	8-50
Combining Geometric Characteristics	8-50
Composite Position Tolerancing	8-51
Using Feature Control Frames with Leaders	8-52
Projected Tolerance Zone	8-53
Creating Annotative Dimensions, Tolerances, Leaders, and Multileaders	8-56
Self-Evaluation Test	8-56
Review Questions	8-57

Chapter 9: Editing Dimensions

Editing Dimensions Using Editing Tools	9-2
Editing Dimensions by Stretching	9-2
Editing Dimensions by Trimming and Extending	9-3
Flipping Dimension Arrow	9-5
Modifying the Dimensions	9-5
Editing the Dimension Text	9-7
Updating Dimensions	9-8
Editing Dimensions with Grips	9-8
Editing Dimensions Using the Properties Palette	9-8
Model Space and Paper Space Dimensioning	9-12
Self-Evaluation Test	9-14
Review Questions	9-14

Chapter 10: Dimension Styles, Multileader Styles, and System Variables

Using Styles and Variables to Control Dimensions	10-2
Creating and Restoring Dimension Styles	10-2
New Dimension Style Dialog box	10-3
Controlling the Dimension Text Format	10-11
Fitting Dimension Text and Arrowheads	10-16
Formatting Primary Dimension Units	10-19
Formatting Alternate Dimension Units	10-23
Formatting the Tolerances	10-25
Dimension Style Families	10-29
Using Dimension Style Overrides	10-32
Comparing and Listing Dimension Styles	10-34
Using Externally Referenced Dimension Styles	10-34
Creating and Restoring Multileader Styles	10-35

Modify Multileader Style Dialog Box	10-36
Self-Evaluation Test	10-43
Review Questions	10-43

Chapter 11: Adding Constraints to Sketches

Introduction	11-2
Adding Geometric Constraints	11-2
Applying the Horizontal Constraint	11-2
Applying the Vertical Constraint	11-3
Applying the Coincident Constraint	11-4
Applying the Fix Constraint	11-4
Applying the Perpendicular Constraint	11-5
Applying the Parallel Constraint	11-5
Applying the Collinear Constraint	11-6
Applying the Concentric Constraint	11-6
Applying the Tangent Constraint	11-6
Applying the Symmetric Constraint	11-7
Applying the Equal Constraint	11-7
Applying the Smooth Constraint	11-8
Controlling the Display of Constraints	11-8
Applying Constraints Automatically	11-13
Applying Dimensional Constraints	11-14
Converting a Dimensional Constraint into an Annotational Constraint	11-15
Concept of a Fully-Defined Sketch	11-16
Under-defined	11-16
Fully-defined	11-16
Over-defined	11-16
Controlling the Display of the Dimensional Constraint	11-17
Working with Equations	11-22
Adding Equations while Applying Dimensional Constraints	11-22
Adding Equations Using the Parameters Manager	11-23
Self-Evaluation Test	11-27
Review Questions	11-28

Chapter 12: Hatching Drawings

Hatching	12-2
Hatch Patterns	12-2
Hatch Boundary	12-2
Hatching Drawings Using the Hatch Tool	12-3
Panels in the Hatch Creation Tab	12-4
Creating Annotative Hatch	12-17
Hatching the Drawing Using the Tool Palettes	12-17
Drag and Drop Method	12-18
Select and Place Method	12-18
Modifying the Properties of the Predefined Patterns available in the Tool Palettes	12-18

Hatching Around Text, Dimensions, and Attributes	12-20
Editing Hatch Patterns	12-20
Using the Hatch Editor Tab	12-20
Using the Edit Hatch Tool	12-20
Using the Properties Tool	12-22
Editing the Hatch Boundary	12-24
Using Grips	12-24
Trimming the Hatch Patterns	12-25
Using AutoCAD Editing Tools	12-27
Hatching Blocks and Xref Drawings	12-27
Creating a Boundary Using Closed Loops	12-28
Other Features of Hatching	12-29
Self-Evaluation Test	12-30
Review Questions	12-31

Chapter 13: Model Space Viewports, Paper Space Viewports, and Layouts

Model Space and Paper Space/Layouts	13-2
Model Space Viewports (Tiled Viewports)	13-2
Creating Tiled Viewports	13-2
Making a Viewport Current	13-5
Joining Two Adjacent Viewports	13-5
Splitting and Resizing Viewports in Model Space	13-6
Paper Space Viewports (Floating Viewports)	13-7
Creating Floating Viewports	13-7
Creating Rectangular Viewports	13-8
Creating Polygonal Viewports	13-9
Converting an Existing Closed Object into a Viewport	13-10
Temporary Model Space	13-11
Editing Viewports	13-13
Controlling the Display of Objects in Viewports	13-13
Locking the Display of Objects in Viewports	13-13
Controlling the Display of Hidden Lines in Viewports	13-13
Clipping Existing Viewports	13-14
Maximizing Viewports	13-15
Controlling the Properties of Viewport Layers	13-16
Controlling the Layers in Viewports Using Layer Properties Manager	13-18
Paper Space Linetype Scaling (PSLTSCALE System variable)	13-20
Inserting Layouts	13-21
Importing Layouts to Sheet Sets	13-24
Inserting a Layout Using the Wizard	13-24
Defining Page Settings	13-24
Working with the MVSETUP Command	13-26
Converting the Distance Between Model Space and Paper Space	13-30
Controlling the Display of Annotative Objects in Viewports	13-31

Self-Evaluation Test	13-34
Review Questions	13-34

Chapter 14: Plotting Drawings

Plotting Drawings in AutoCAD	14-2
Plotting Drawings Using the Plot Dialog Box	14-2
Adding Plotters	14-9
Editing the Plotter Configuration	14-11
Importing PCP/PC2 Configuration Files	14-13
Setting Plot Parameters	14-13
Working with Page Setups	14-13
Using Plot Styles	14-16
Adding a Plot Style	14-17
Plot Style Table Editor	14-19
Applying Plot Styles	14-22
Setting the Current Plot Style	14-23
Plotting Sheets in a Sheet Set	14-27
Self-Evaluation Test	14-27
Review Questions	14-28

Chapter 15: Template Drawings

Creating Template Drawings	15-2
Standard Template Drawings	15-2
Loading a Template Drawing	15-7
Customizing Drawings with Layers and Dimensioning Specifications	15-8
Customizing a Drawing with Layout	15-13
Customizing Drawings with Viewports	15-17
Customizing Drawings According to Plot Size and Drawing Scale	15-19
Self-Evaluation Test	15-23
Review Questions	15-24

Chapter 16: Working with Blocks

The Concept of Blocks	16-2
Converting Entities into a Block	16-2
Inserting Blocks	16-5
Creating and Inserting Annotative Blocks	16-12
Block Editor	16-14
Dynamic Blocks	16-16
Adding Parameter and Action Simultaneously Using Parameter Sets	16-32
Inserting Blocks Using the DesignCenter	16-33
Using Tool Palettes to Insert Blocks	16-33
Inserting Blocks in the Drawing	16-34
Modifying Properties of the Blocks in the Tool Palettes	16-34
Adding Blocks in Tool Palettes	16-35

Drag and Drop Method	16-36
Shortcut Menu	16-36
Modifying Existing Blocks in the Tool Palettes	16-36
Layers, Colors, Linetypes, and Lineweights for Blocks	16-37
Nesting of Blocks	16-38
Inserting Multiple Blocks	16-40
Creating Drawing Files Using the Write Block Dialog box	16-42
Defining the Insertion Base Point	16-44
Editing Blocks	16-44
Editing Blocks in Place	16-44
Exploding Blocks Using the XPLODE Command	16-47
Renaming Blocks	16-49
Deleting Unused Blocks	16-50
Applying Constraints to Blocks	16-50
Self-Evaluation Test	16-57
Review Questions	16-57

Chapter 17: Defining Block Attributes

Understanding Attributes	17-2
Defining Attributes	17-2
Editing Attribute Definition	17-7
Using the Properties Palette	17-7
Inserting Blocks with Attributes	17-8
Managing Attributes	17-11
Extracting Attributes	17-17
Controlling the Attribute Visibility	17-35
Editing Block Attributes	17-36
Editing Attributes Using the Enhanced Attribute Editor	17-36
Editing Attributes Using the Edit Attributes Dialog Box	17-38
Global Editing of Attributes	17-40
Redefining a Block with Attributes	17-45
In-place Editing of Blocks with Attributes	17-46
Inserting Text Files in the Drawing	17-46
Self-Evaluation Test	17-47
Review Questions	17-48

Chapter 18: Understanding External References

External References	18-2
Dependent Symbols	18-2
Managing External References in a Drawing	18-4
The Overlay Option	18-12
Attaching Files to a Drawing	18-15
Working with Underlays	18-16
Editing an Underlay	18-17
Opening an Xreffed Object in a Separate Window	18-18

Using the DesignCenter to Attach a Drawing as an Xref	18-18
Adding Xref Dependent Named Objects	18-19
Clipping External References	18-21
Displaying Clipping Frame	18-23
Demand Loading	18-23
Editing References In-Place	18-25
Self-Evaluation Test	18-26
Review Questions	18-27

Chapter 19: Working with Advanced Drawing Options

Understanding the Use of Multilines	19-2
Defining the Multiline Style	19-2
Drawing Multilines	19-6
Editing Multilines by Using Grips	19-8
Editing Multilines by Using Dialog Box	19-8
Cross Intersection (CC/OC/MC)	19-9
Tee Intersection (CT/OT/MT)	19-10
Corner Joint (CJ)	19-11
Adding and Deleting Vertices (AV/DV)	19-12
Cutting and Welding Multilines (CS/CA/WA)	19-12
Creating Revision Clouds	19-15
Rectangular Revision Cloud	19-15
Polygonal Revision Cloud	19-16
Freehand Revision Cloud	19-16
Creating Wipeouts	19-17
Creating NURBS	19-18
Editing Splines	19-20
Editing Splines using 3D Edit Bar	19-25
Self-Evaluation Test	19-25
Review Questions	19-26

Chapter 20: Grouping and Advanced Editing of Sketched Objects

Grouping Sketched Objects Using the Object Grouping Dialog Box	20-2
Grouping Sketched Objects Using the Group Button	20-7
Selecting Groups	20-7
Changing Properties of an Object	20-8
Exploding Compound Objects	20-14
Editing Polylines	20-15
Editing Single Polyline	20-16
Editing Multiple Polylines	20-29
Undoing Previous Commands	20-31
Reversing the Undo Operation	20-35
Renaming Named Objects	20-36
Removing Unused Named Objects	20-37
View items you can purge	20-37
View items you cannot purge	20-38

Setting Selection Modes Using the Options Dialog Box	20-39
Noun/verb selection	20-39
Use Shift to add to selection Option	20-40
Implied windowing	20-40
Press and drag	20-41
Object grouping	20-41
Associative Hatch	20-41
Pickbox Size	20-41
Window selection method	20-41
Self-Evaluation Test	20-42
Review Questions	20-42

Chapter 21: Working with Data Exchange & Object Linking and Embedding

Understanding the Concept of Data Exchange in AutoCAD	21-2
Creating Data Interchange (DXF) Files	21-2
Creating a Data Interchange File	21-2
Information in a DXF File	21-3
Converting DXF Files into Drawing Files	21-3
Importing CAD Files	21-4
Other Data Exchange Formats	21-4
DXB File Format	21-4
Creating and Using an ACIS File	21-4
Importing PDF Files	21-5
Importing 3D Studio Files	21-6
Creating and Using a Windows Metafile	21-7
Creating and Using a V8 DGN File	21-7
Creating a BMP File	21-7
Raster Images	21-8
Attaching Raster Images	21-8
Managing Raster Images	21-10
Editing Raster Image Files	21-11
Clipping Raster Images	21-12
Adjusting Raster Images	21-13
Modifying the Image Quality	21-14
Modifying the Transparency of an Image	21-14
Controlling the Display of Image Frames	21-15
Changing the Display Order	21-15
Other Editing Operations	21-15
Scaling Raster Images	21-15
DWG Convert	21-16
Conversion Setup Options	21-17
Working with PostScript Files	21-20
Creating PostScript Files	21-20
Object Linking and Embedding (OLE)	21-22

Self-Evaluation Test	21-30
Review Questions	21-31

CHAPTERS AVAILABLE FOR FREE DOWNLOAD

In this textbook three chapters have been given for free download. You can download these chapters from our website *www.cadcim.com*. To download these chapters follow the given path: *Textbooks > CAD/CAM > AutoCAD > AutoCAD 2017: A Problem-Solving Approach, Basic and Intermediate > Chapters for Free Download* and then select the chapter name from the **Chapters for Free Download** drop-down. Click the **Download** button to download the chapter in the PDF format.

Chapter 22: Conventional Dimensioning and Projection Theory Using AutoCAD

Chapter 23: Concepts of Geometric Dimensioning and Tolerancing

Chapter 24: Isometric Drawings

This page is intentionally left blank

Preface

AutoCAD 2017

AutoCAD, developed by Autodesk Inc., is the most popular PC-CAD system available in the market. Today, over 7 million people use AutoCAD and other AutoCAD-based design products. 100% of the Fortune 100 firms and 98% of the Fortune 500 firms are Autodesk customers. AutoCAD's open architecture allows third-party developers to write application software which has significantly added to its popularity. For example, the author of this book has developed a software package “**SMLayout**” for sheet metal products that generates a flat layout of various geometrical shapes such as transitions, intersections, cones, elbows, tank heads, and so on. Several companies in Canada and United States are using this software package with AutoCAD to design and manufacture various products. AutoCAD also facilitates customization that enables the users to increase their efficiency and improve their productivity.

The **AutoCAD 2017 for Engineers and Designers, Basic and Intermediate** textbook contains a detailed explanation of AutoCAD commands and their applications to solve drafting and design problems. Every AutoCAD command is thoroughly explained with the help of examples and illustrations. This makes it easy for the users to understand the functions and applications in the drawing. After reading this textbook, you will be able to use AutoCAD commands to make a drawing, dimension a drawing, apply constraints to sketches, insert symbols as well as create text, blocks and dynamic blocks.

The book also covers basic drafting and design concepts that provide you with the essential drafting skills to solve the drawing problems in AutoCAD. These include dimensioning principles, and assembly drawings. While going through this textbook, you will discover some new unique applications of AutoCAD that will have a significant effect on your drawings. In addition, you will be able to understand why AutoCAD has become such a popular software package and an international standard in PC-CAD.

Symbols Used in the Textbook

Note



The author has provided additional information to the users about the topic being discussed in the form of notes.

Tip



Special information and techniques are provided in the form of tips that will increase the efficiency of the users.

New



This symbol indicates that the command or tool being discussed is new.


Enhanced



This symbol indicates that the command or the tool being discussed has been enhanced in AutoCAD 2017.

Formatting Conventions Used in the Textbook

Refer to the following list for the formatting conventions used in this textbook.

- Command names are capitalized and written in boldface letters. Example: The **MOVE** command
- A key icon appears when you have to respond by pressing the ENTER or the RETURN key. 
- Command sequences are indented. The responses are indicated in boldface. The directions are indicated in italics and the comments are enclosed in parentheses. Command: **MOVE**
Select object: **G**
Enter group name: *Enter a group name (the group name is group1)*
- The methods of invoking a tool/option from the **Ribbon**, **Menu Bar**, **Quick Access Toolbar**, **Tool Palettes**, **Application menu**, toolbars, Status Bar, and Command prompt are enclosed in a shaded box.

Ribbon:	Draw > Line
Menu Bar:	Draw > Line
Tool Palettes:	Draw > Line
Toolbar:	Draw > Line
Command:	LINE or L

Naming Conventions Used in the Textbook

Tool

If you click on an item in a toolbar or a panel of the **Ribbon** and a command is invoked to create/edit an object or perform some action, then that item is termed as **tool**.

For example:

To Create: **Line** tool, **Circle** tool, **Extrude** tool

To Edit: **Fillet** tool, **Array** tool, **Stretch** tool

Action: **Zoom** tool, **Move** tool, **Copy** tool

If you click on an item in a toolbar or a panel of the **Ribbon** and a dialog box is invoked wherein you can set the properties to create/edit an object, then that item is also termed as **tool**, refer to Figure 1.

For example:

To Create: **Define Attributes** tool, **Create** tool, **Insert** tool

To Edit: **Edit Attributes** tool, **Block Editor** tool

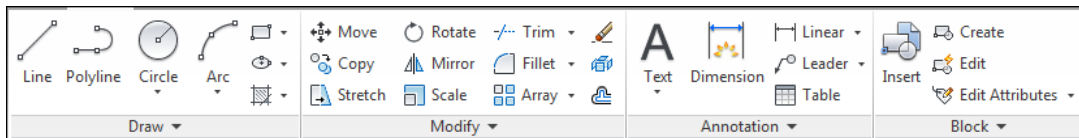


Figure 1 Various tools in the Ribbon

Button

If you click on an item in a toolbar or a panel of the **Ribbon** and the display of the corresponding object is toggled on/off, then that item is termed as **Button**. For example, **Grid** button, **Snap** button, **Ortho** button, **Properties** button, **Tool Palettes** button, and so on; refer to Figure 2.

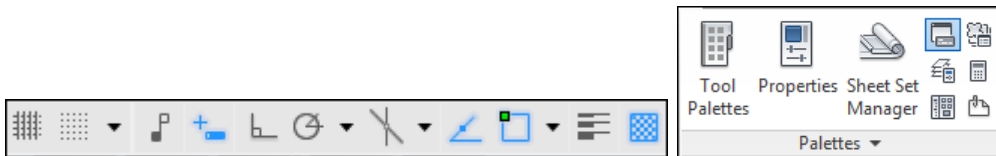


Figure 2 Various buttons displayed in the Status Bar and Ribbon

The item in a dialog box that has a 3d shape like a button is also termed as **Button**. For example, **OK** button, **Cancel** button, **Apply** button, and so on.

Dialog Box

The naming conventions used for the components in a dialog box are mentioned in Figure 3.

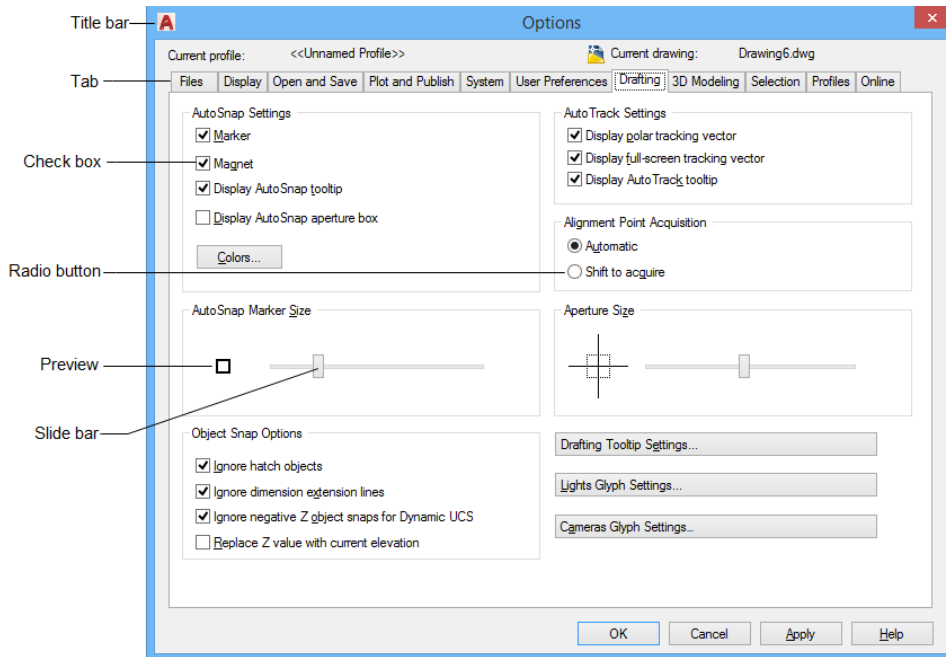


Figure 3 The components of a dialog box

Drop-down

A drop-down is the one in which a set of common tools are grouped together. You can identify a drop-down with a down arrow on it. These drop-downs are given a name based on the tools grouped in them. For example, **Circle** drop-down, **Fillet/Chamfer** drop-down, **Create Light** drop-down, and so on; refer to Figure 4.

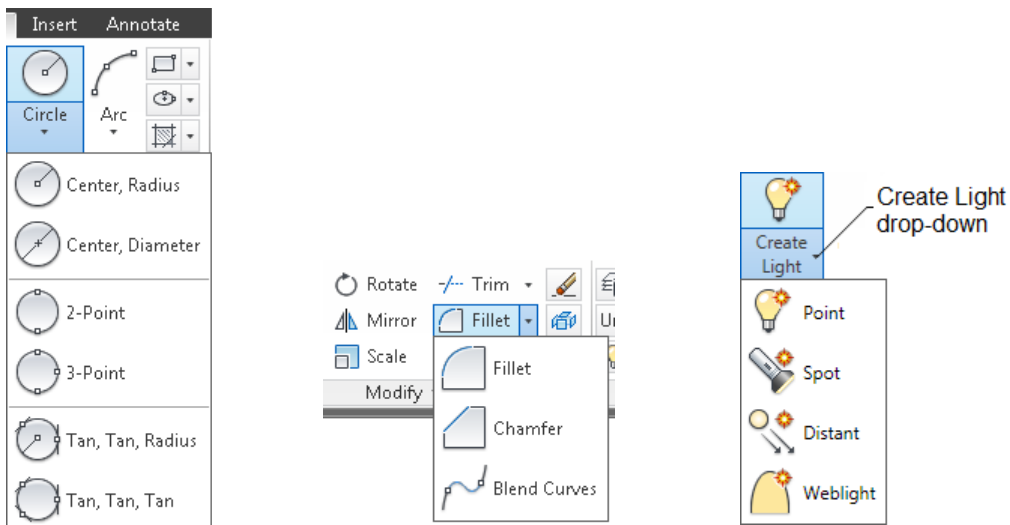


Figure 4 The Circle, Fillet/Chamfer, and Create Light drop-downs

Drop-down List

A drop-down list is the one in which a set of options are grouped together. You can set various parameters using these options. You can identify a drop-down list with a down arrow on it. To know the name of a drop-down list, move the cursor over it; its name will be displayed as a tool tip. For example, **Lineweight** drop-down list, **Linetype** drop-down list, **Object Color** drop-down list, **Visual Styles** drop-down list, and so on; refer to Figure 5.

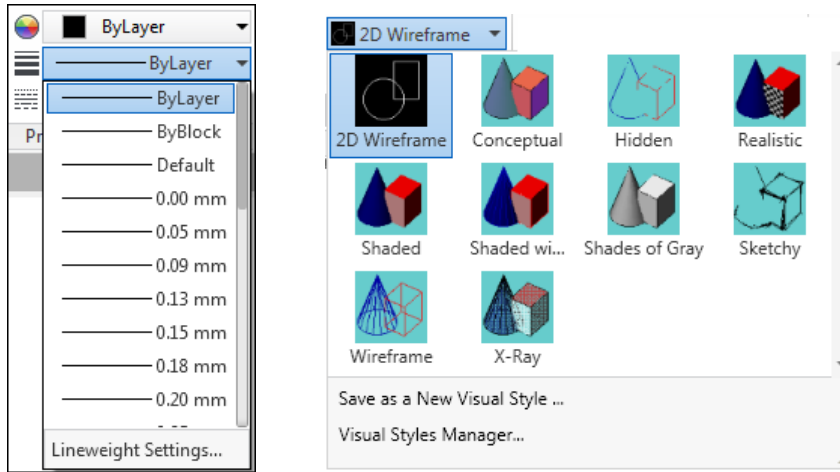


Figure 5 The *Lineweight* and *Visual Styles* drop-down lists

Options

Options are the items that are available in shortcut menu, drop-down list, Command prompt, **Properties** panel, and so on. For example, choose the **Properties** option from the shortcut menu displayed on right-clicking in the drawing area; refer to Figure 6.

Tools and Options in Menu Bar

A menu bar consists of both tools and options. As mentioned earlier, the term **tool** is used to create/edit something or to perform some action. For example, in Figure 7, the item **Box** has been used to create a box shaped surface, therefore it will be referred to as the **Box** tool.

Similarly, an option in the menu bar is the one that is used to set some parameters. For example, in Figure 7, the item **Linetype** has been used to set/load the linetype, therefore it will be referred to as an option.

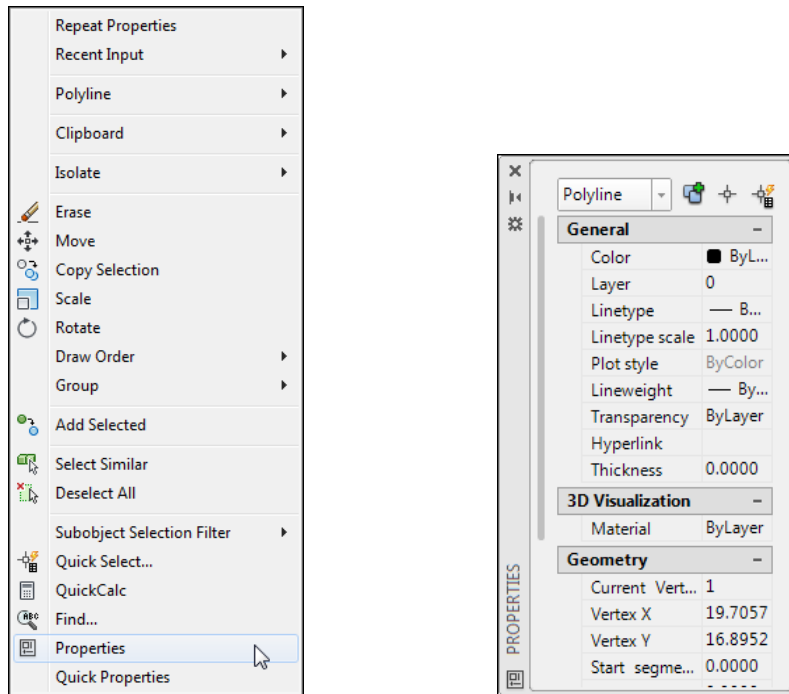


Figure 6 Options in the shortcut menu and the **PROPERTIES** palette

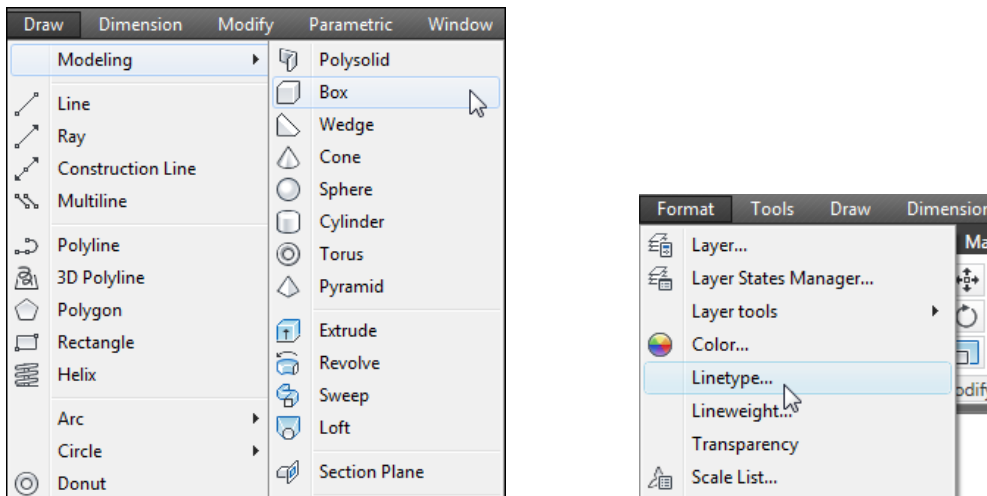


Figure 7 Tools and options in the menu bar

Free Companion Website

It has been our constant endeavor to provide you the best textbooks and services at affordable price. In this endeavor, we have come out with a Free Companion website that will facilitate the process of teaching and learning of AutoCAD 2017. If you purchase this textbook, you will get access to the files on the Companion website.

The following resources are available for the faculty and students in this website:

Faculty Resources

- **Technical Support**

The faculty can get online technical support by contacting *techsupport@cadcim.com*.

- **Instructor Guide**

Solutions to all review questions and exercises in the textbook are provided in this link to help the faculty members test the skills of the students.

- **PowerPoint Presentations**

These slides provide the basis for a lecture outline and help you present concepts and material. The key points and concepts can be graphically highlighted for student retention.

- **Part Files**

The part files used in illustrations, examples, and exercises are available for free download.

Student Resources

- **Technical Support**

You can get online technical support by contacting *techsupport@cadcim.com*.

- **Part Files**

The part files used in illustrations and examples are available for free download.

You can access additional learning resources by visiting *http://allaboutcadcam.blogspot.com*.

If you face any problem in accessing these files, please contact the publisher at *sales@cadcim.com* or the author at *stickoo@pnw.edu* or *tickoo525@gmail.com*.

Stay Connected

You can now stay connected with us through Facebook and Twitter to get the latest information about our textbooks, videos, and teaching/learning resources. To stay informed of such updates, follow us on Facebook (*www.facebook.com/cadcim*) and Twitter (*@cadcimtech*). You can also subscribe to our You Tube channel (*www.youtube.com/cadcimtech*) to get the information about our latest video tutorials.

This page is intentionally left blank