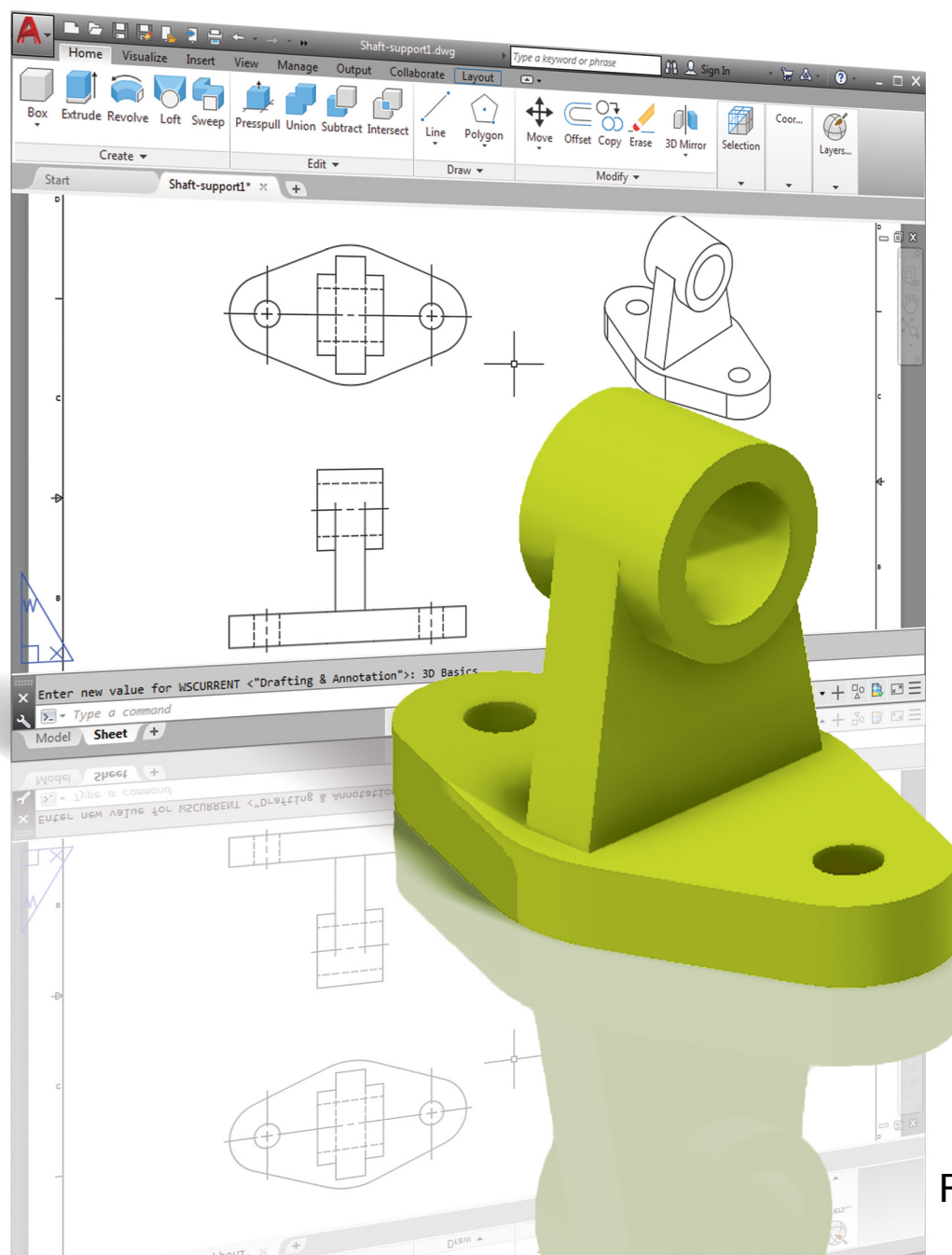


# AutoCAD® 2019

## Tutorial Second Level

### 3D Modeling



Randy H. Shih

Visit the following websites to learn more about this book:



**amazon.com**

**Google books**

**BARNES&NOBLE**

# Table of Contents

## **Preface**

## **Acknowledgments**

## **Introduction**

## **Getting Started**

Introduction	Intro-2
Development of Computer Geometric Modeling	Intro-2
Why Use AutoCAD 2019?	Intro-5
Getting Started with AutoCAD 2019	Intro-7
AutoCAD 2019 Screen Layout	Intro-8
Application Menu	Intro-9
Quick Access Toolbar	Intro-9
AutoCAD Menu Bar	Intro-9
Layout Tabs	Intro-9
Drawing Area	Intro-10
Graphics Cursor or Crosshairs	Intro-10
Command Prompt Area	Intro-10
Cursor Coordinates	Intro-10
Status Toolbar	Intro-10
Ribbon Tabs and Panels	Intro-11
Draw and Modify Toolbar Panels	Intro-11
Layers Control Toolbar Panel	Intro-11
Viewport/View/Display Controls	Intro-11
Mouse Buttons	Intro-12
[Esc] - Canceling commands	Intro-12
Online Help	Intro-13
Leaving AutoCAD 2019	Intro-14
Creating a CAD File Folder	Intro-14

## **Chapter 1**

## **AutoCAD 2D Isometric Drawings**

Introduction	1-2
The Angle Support Design	1-3
Starting Up AutoCAD 2019	1-4
AutoCAD ISOPLANE and ISODRAFT Commands	1-5
Layers Setup	1-6
Create the Base Box of the Design	1-7
Create the Design inside the Base Box	1-11
Create the Isocircle on the top face	1-14
Using the Editing Tools in an Isometric drawing	1-17
The Tube Anchor Design – Modeling Strategy	1-17

Start a New Drawing and Layers Setup	1-18
Create a Base Box of the Design	1-19
Locate the Centers for the Isocircles	1-22
Create the Isocircles	1-24
Using the Parametric tools to complete the drawing	1-31
Review Questions	1-36
Exercises	1-37

## **Chapter 2**

### **User Coordinate Systems and the Z-Axis**

Introduction	2-2
The Floor Plan Design	2-2
Starting Up AutoCAD 2019	2-3
3D Basic Modeling WorkSpace	2-4
Drawing Units Setup	2-5
Drawing Area Setup	2-6
Grid and Snap Intervals Setup	2-7
Create Polylines	2-9
Create an Offset Polyline	2-10
Create Interior Walls	2-11
Complete the Doorway Using the Trim Command	2-14
User Coordinate System – It is an XY CRT, but an XYZ World	2-16
Viewing the 2D Design in 3D Space	2-17
Add the 3rd Dimension to the Floor Plan Design	2-18
View the Design Using the Hide Option	2-20
Add New Layers	2-21
Move Entities to a Different Layer	2-23
Reposition the UCS	2-23
Create the Roof	2-25
Rotating the UCS	2-27
Sketching on the Rotated UCS	2-28
View the Design Using the Hidden Option	2-29
Review Questions	2-30
Exercises	2-31

## **Chapter 3**

### **3D Wireframe Modeling**

Introduction	3-2
The Locator Design	3-3
Starting Up AutoCAD 2019	3-4
Activate the Startup Option	3-4
Create the Rectangular Base of the Design	3-6
Create a 3D Box	3-7
Object Snap Toolbar	3-10

Use the Snap Options to Locate the Top Corners	3-10
Use the Copy Option to Create Additional Edges	3-12
Use the Trim Command	3-14
Use the View Toolbar	3-16
Dynamic Rotation – Free Orbit	3-16
Use the Offset Command to Create Parallel Edges	3-17
Create a Circle above the UCS Sketch Plane	3-19
Complete the Wireframe Model	3-20
Review Questions	3-22
Exercises	3-23

## **Chapter 4**

### **UCS, Viewports and Wireframe Modeling**

Introduction	4-2
The V-Block Design	4-2
Starting Up AutoCAD 2019	4-3
3D Modeling Workspace	4-3
Layers Setup	4-4
Create the Rectangular Base of the Design	4-5
Create a Wireframe Box	4-6
Using the View and UCS Toolbars	4-7
Create Construction Lines in the Front View	4-8
Copy Objects in the Negative Z Direction	4-10
Create an Inclined Line at the Base of the Model	4-11
Create Object Lines	4-12
Multiple Viewports	4-14
Use the Mirror Command	4-15
Turn Off the Construction Lines	4-17
Create a New UCS	4-18
Create a New Named View	4-20
Create the V-Cut Feature on the Inclined Plane	4-22
Extend the Cut and GRIP Editing	4-23
Review Questions	4-25
Exercises	4-26

## **Chapter 5**

### **3D Surface Modeling**

Introduction	5-2
Starting Up AutoCAD 2019	5-4
The UCS Toolbar and the Meshes Commands	5-5
Create a Mesh Surface Using the 2D Solid Command	5-5
Using the Visual Styles Toolbar	5-8
Create a Mesh Surface Using the 3D Face Command	5-10

The ViewCube	5-12
Create a Surface of Irregular Shape	5-14
Use the Invisible Edge Option	5-16
Repositioning with the Grip Editing Tools	5-17
The Locator Wireframe Model	5-18
Moving Objects to a Different Layer	5-18
Advanced Meshed Surface Modeling Commands	5-20
Use the Tabulated Surface Option	5-23
Use the Ruled Surface Option	5-24
Review Questions	5-27
Exercises	5-28

## **Chapter 6**

### **Solid Modeling - Constructive Solid Geometry**

Introduction	6-2
The Guide-Block Design	6-2
Constructive Solid Geometry Concept	6-3
Binary Tree	6-4
The Guide-Block CSG Binary Tree	6-5
Starting Up AutoCAD 2019	6-6
Layers Setup	6-7
Create the First 3D Object	6-7
Create the Second Solid Feature	6-9
Boolean Operation - Union	6-10
Create the Second Cylinder Feature	6-11
Boolean Operation - Subtract	6-12
Create another Solid Feature	6-13
Visual Styles Options	6-14
Create the Final Feature	6-15
Rotating the Rectangular Block	6-16
Reposition the Rectangular Block	6-17
The SteeringWheels	6-18
Review Questions	6-20
Exercises	6-21

## **Chapter 7**

### **Regions, Extrude and Solid Modeling**

Introduction	7-2
The V-Block-Solid Design	7-2
Starting Up AutoCAD 2019	7-3
Layers Setup	7-4
Setting Up a 2D Sketch	7-5
Defining the Front Edges of the Design	7-7
Create a Region	7-10

Extruding the Created Region	7-11
Create a 2D Sketch at the Base of the Model	7-13
Create a Copy of the 2D Sketch	7-14
Create the Cutter Solids	7-15
Boolean Operation - Subtract	7-16
Mass Properties of the Solid Model	7-17
Align the UCS to the Inclined Face	7-18
Create the V-Cut	7-19
Review Questions	7-22
Exercises	7-23

## **Chapter 8**

### **Multiview Drawings from 3D Models**

Introduction	8-2
The V-Block Design	8-2
Starting Up AutoCAD 2019	8-3
AutoCAD Paper Space	8-4
Delete the Displayed Viewport	8-5
Add Borders and Title Block in the Layout	8-6
Setting Up Viewports inside the Title Block	8-7
Setting Up the Standard Views	8-8
Determine the Necessary 2D Views	8-10
Establish an Auxiliary View in Model Mode	8-11
Add a Viewport for an Auxiliary View	8-13
Use the DVIEW Command	8-16
Adjust the Viewport Scale	8-17
Lock the Base View	8-18
Align the 2D Views	8-18
Create 2D Projected Entities - SOLPROF	8-21
Complete the 2D Drawing	8-23
Review Questions	8-25
Exercises	8-26

## **Chapter 9**

### **Symmetrical Features in Designs**

Introduction	9-2
A Revolved Design: Pulley	9-2
Modeling Strategy - A Revolved Design	9-3
Starting Up AutoCAD 2019	9-4
Layers Setup	9-5
Set Up a 2D Sketch for the Revolved Feature	9-6
Perform 2D Boolean Operations	9-8
Create the Revolved Feature	9-12
Mirrored Image of the Part	9-13

Combine Two Parts into One	9-14
Use the 3D Array command	9-15
Position and Perform the Cut	9-18
Review Questions	9-20
Exercises	9-21

## **Chapter 10**

### **Advanced Modeling Tools & Techniques**

Introduction	10-2
A Thin-Walled Design: Oil Sink	10-2
Modeling Strategy	10-3
Starting Up AutoCAD 2019	10-4
Layers Setup	10-5
The First Extruded Feature	10-6
Create an Offset Geometry from an Extracted Surface	10-8
Extrude with Draft Angle	10-10
Align the Parts	10-11
Create another Extracted Surface	10-12
Combining Parts – Boolean Union	10-15
Create 3D Rounds and Fillets	10-16
Create a Shell Feature	10-18
Create a Rectangular Array Cut Feature	10-19
Create another Rectangular Array Cut Feature	10-21
Making a Design Change	10-23
Grip Editing Approach	10-23
Dynamic UCS Approach	10-24
Review Questions	10-27
Exercises	10-28

## **Chapter 11**

### **Conceptual Design Tools & Techniques**

Introduction	11-2
A Bird House Design	11-3
Starting Up AutoCAD 2019	11-4
Layers Setup	11-5
The Base Plate	11-6
Create the Compartments for the 1 <sup>st</sup> Floor	11-7
Using the Press/Pull Command	11-8
Using the Press/Pull Command as an Editing Tool	11-10
Create another Cut Feature	11-11
Adjust the Compartments	11-13
Add Additional Compartments	11-14
Create the Doors	11-15
Create the 2 <sup>nd</sup> Floor	11-16



Reposition the 2 <sup>nd</sup> Floor	11-18
Modeling the Roof Section with the Press/Pull Command	11-19
Use the Imprint Command	11-21
Review Questions	11-24
Exercises	11-25

## **Chapter 12**

### **Introduction to Photorealistic Rendering**

Introduction	12-2
Start Up AutoCAD 2019 and Retrieve the Pulley Design	12-3
Environment Setup	12-4
Use the Render Command	12-7
Available Lighting Simulation Modes in AutoCAD	12-8
Use the Materials Options	12-9
Activate the Sun & Sky Background Option	12-11
Add Additional Walls	12-14
Create a Point Light	12-17
Changing the Applied Materials	12-19
Create a Spotlight	12-20
Removing a Light	12-22
Create a Distant Light	12-23
Create New Materials	12-26
Save the Rendered Images	12-29
Conclusion	12-30
Review Questions	12-31
Exercises	12-32

## **Index**