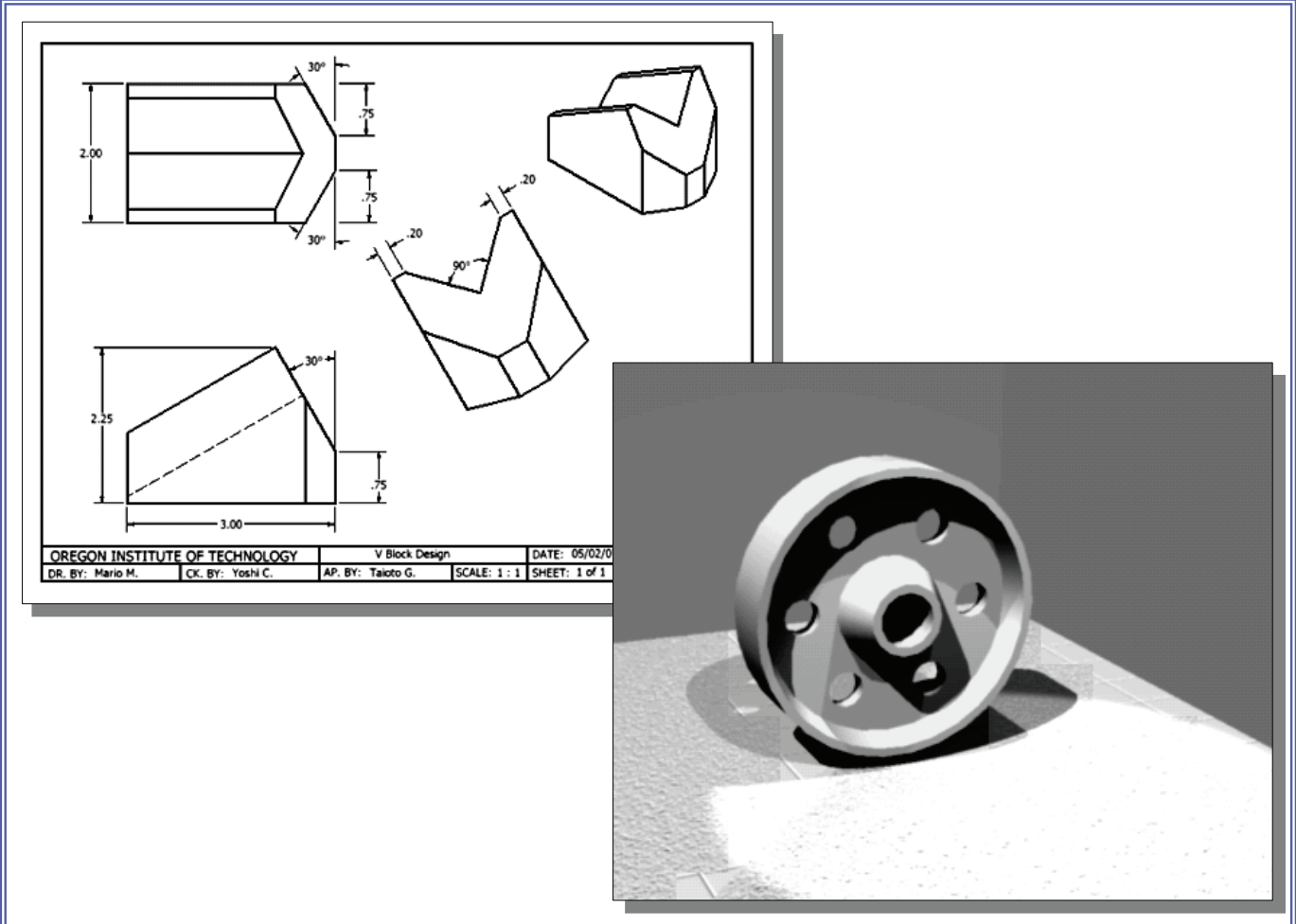


# AutoCAD® 2011 Tutorial

## Second Level: 3D Modeling



**Randy H. Shih**  
*Oregon Institute of Technology*

**SDC**  
PUBLICATIONS

[www.SDCpublications.com](http://www.SDCpublications.com)

Schroff Development Corporation

**INCLUDES NEW CHAPTER**  
Introduction to  
Photorealistic  
Rendering

# Table of Contents

## Preface

## Acknowledgments

## Chapter 1

### Getting Started

Introduction	1-2
Development of Computer Geometric Modeling	1-2
Why Use AutoCAD® 2011	1-5
Getting Started with AutoCAD® 2011	1-7
AutoCAD® 2011 Screen Layout	1-8
Application Menu	1-9
Quick Access Toolbar	1-9
AutoCAD Menu Bar	1-9
Graphics Cursor or Crosshairs	1-9
Command prompt Area	1-9
Cursor Coordinates	1-10
Status Toolbar	1-10
Ribbon Tabs and Panels	1-10
Draw and Modify Toolbar Panel	1-10
Layers Control Toolbar Panel	1-11
Annotation Toolbar Panel	1-11
Layout/Model Toolbar	1-11
Viewing Toolbar	1-11
Workspace Switching	1-11
Mouse Buttons	1-12
[Esc] - Canceling commands	1-12
On-Line Help	1-13
Leaving AutoCAD® 2011	1-14
Creating a CAD File Folder	1-15

## Chapter 2

### User Coordinate System and the Z-Axis

Introduction	2-2
The Floor Plan Design	2-2
Starting Up AutoCAD® 2011	2-3
3D Modeling WorkSpace	2-4
Drawing Units Setup	2-5
Drawing Area Setup	2-6
GRID and SNAP Intervals Setup	2-7
Drawing Polylines	2-9
Creating an Offset Polyline	2-10
Creating Interior Walls	2-11
Completing 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
Adding the 3rd Dimension to the Floor Plan Design	2-18
Viewing the Design Using the Hide Option	2-20
Adding New Layers	2-21
Moving Entities to a Different Layer	2-23
Moving the UCS	2-23
Creating the Roof	2-25
Rotating the UCS	2-27
Sketching on the Rotated UCS	2-28
Viewing the Design Using the Hidden Option	2-29
Questions	2-30
Exercises	2-31

### Chapter 3

## 3D Wireframe Modeling

Introduction	3-2
The Locator Design	3-3
Starting Up AutoCAD® 2011	3-4
Using the Startup Options	3-4
Creating the Rectangular Base of the Design	3-6
Create a 3D Box	3-7
Object Snap Toolbar	3-10
Using the Snap Options to Locate the Top Corners	3-10
Using the Copy Option to Create Additional Edges	3-12
Using the <i>TRIM</i> Command	3-14
Using the View Toolbar	3-16
Dynamic Rotation – Free Orbit	3-16
Using the <i>OFFSET</i> Command to Create Parallel Edges	3-17
Creating a Circle Above the UCS Sketch Plane	3-19
Completing the Wireframe Model	3-20
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® 2011	4-3
Layers Setup	4-4
Creating the Rectangular Base of the Design	4-5
Creating a Wireframe Box	4-6
Using the View and the UCS Toolbars	4-7
Creating Construction Lines in the Front View	4-8
Copying in the Negative Z Direction	4-10
Creating an Inclined Line at the Base of the Model	4-11

Creating Object Lines	4-12
Multiple Viewports	4-14
Using the <i>MIRROR</i> Command	4-15
Turn <i>OFF</i> the Construction Lines	4-17
Creating a New UCS	4-18
Creating a New Named View	4-20
Creating the V-Cut Feature on the Inclined Plane	4-22
Extend the Cut and GRIP Editing	4-23
Questions	4-25
Exercises	4-26

## **Chapter 5**

### **3D Surface Modeling**

Introduction	5-2
Starting Up AutoCAD® 2011	5-4
Using the UCS Toolbars and the Meshes Commands	5-5
Creating a Surface Using the <i>2D SOLID</i> Command	5-5
Using the Visual Styles Toolbar	5-8
Creating a Surface Using the <i>3D FACE</i> Command	5-10
The ViewCube	5-12
Creating a Surface of Irregular Shape	5-14
Using the <i>Invisible Edge</i> Option	5-16
Moving with the Grip Editing Tools	5-17
The <i>Locator</i> Wireframe Model	5-18
Moving Objects to a Different Layer	5-18
Advanced Surface Modeling Commands	5-20
Using the <i>Tabulated Surface</i> Option	5-23
Using the <i>Ruled Surface</i> Option	5-24
Questions	5-27
Exercises	5-28

## **Chapter 6**

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

Introduction	6-2
The Guide-Block Design	6-2
<i>Constructive Solid Geometry</i> Concept	6-3
Binary Tree	6-4
The Guide-Block CSG Binary Tree	6-5
Starting Up AutoCAD® 2011	6-6
Layers Setup	6-7
Creating the First 3D object	6-7
Creating the Second Solid Feature	6-9
Boolean Operation - <i>UNION</i>	6-10
Creating the Second Cylinder Feature	6-11
Boolean Operation - <i>SUBTRACT</i>	6-12
Creating another Solid Feature	6-13

Visual Styles Options	6-14
Creating the Final Feature	6-15
Rotating the Rectangular Block	6-16
Moving the Rectangular Block	6-17
The SteeringWheels	6-18
Questions	6-20
Exercises	6-21

## Chapter 7

### Regions, Extrude and Solid Modeling

Introduction	7-2
The V-BlockSolid Design	7-2
Starting Up AutoCAD® 2011	7-3
Layers Setup	7-4
Setting Up a 2D Sketch	7-5
Defining the Front Edges of the Design	7-7
Creating a Region	7-10
Extruding the Created Region	7-11
Creating a 2D Sketch at the Base of the Model	7-13
Creating a Copy of the 2D Sketch	7-14
Creating the Cutter Solids	7-15
Boolean Operation - <i>Subtract</i>	7-16
Mass Properties of the Solid Model	7-17
Align the UCS to the Inclined Face	7-18
Creating the <i>V-Cut</i>	7-19
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® 2011	8-3
AutoCAD Paper Space	8-4
Deleting the Displayed Viewport	8-5
Adding 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
Determining the Necessary 2D Views	8-10
Establishing an Auxiliary View in Model Mode	8-11
Adding a Viewport for an Auxiliary View	8-13
Using the <i>DVIEW</i> Command	8-16
Adjusting the Viewport Scale	8-17
Locking the Base View	8-18
Aligning the 2D Views	8-18
Creating 2D Projected Entities - SOLPROF	8-21

Completing the 2D Drawing	8-23
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® 2011	9-4
Layers Setup	9-5
Setting Up a 2D Sketch for the Revolved Feature	9-6
Perform 2D Boolean Operations	9-8
Creating the Revolved Feature	9-12
Mirroring Part	9-13
Combining Parts	9-14
3D Array	9-15
Position and Perform the Cut	9-18
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® 2011	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
Aligning the Parts	10-11
Create another Extracted Surface	10-12
Combining Parts – Boolean UNION	10-15
Creating 3D Rounds and Fillets	10-16
Creating a Shell Feature	10-18
Creating a Rectangular Array Cut Feature	10-19
Creating another Rectangular Array Cut Feature	10-21
Making a Design Change	10-23
Grip Editing Approach	10-23
Dynamic UCS Approach	10-25
Questions	10-27
Exercises	10-28

**Chapter 11****Conceptual Design Tools & Techniques**

Introduction	11-2
A Bird House Design	11-3
Starting Up AutoCAD® 2011	11-4
Layers Setup	11-5
The Base Plate	11-6
Create the 1 <sup>st</sup> Floor Inside Compartments	11-7
Create a Solid Feature Using the Press/Pull Command	11-8
Using the Press/Pull Command as an Editing Tool	11-10
Create another Cut Feature	11-11
Adjusting the Compartments	11-13
Adding Additional Compartments	11-14
Creating the Doors	11-15
Creating the 2 <sup>nd</sup> Floor	11-16
Repositioning the 2 <sup>nd</sup> Floor	11-18
Modeling the Roof Section with the Press/Pull Command	11-19
Using the Imprint Command	11-21
Questions	11-24
Exercises	11-25

**Chapter 12****Introduction to Photorealistic Rendering**

Introduction	12-2
Starting Up AutoCAD® 2011 and retrieve the Pulley design	12-3
Environment Setup	12-4
Using the Render command	12-7
Available Lighting Simulation Modes in AutoCAD	12-8
Using the Materials Options	12-9
Activate the Sun & Sky Background option	12-11
Adding Additional Walls	12-14
Creating a Point Light	12-17
Changing the Applied Materials	12-19
Creating a Spotlight	12-20
Removing a Light	12-22
Creating a Distant Light	12-23
Creating New Materials	12-26
Saving the Rendered Images	12-29
Conclusion	12-30
Questions	12-31

**Index**