Autodesk AutoCAD Advanced

Target Audience

The AutoCAD Advanced course is designed for professionals such as architects, engineers, designers, and drafters who have a solid understanding of basic AutoCAD features and are looking to enhance their skills to work on complex designs, improve efficiency, and master advanced tools and techniques.

Course Objective

This course aims to equip participants with advanced skills in AutoCAD to create, manage, and optimize intricate designs, ensuring precision and productivity in their projects. By the end of the course, participants will be proficient in leveraging AutoCAD's advanced features for professional applications.

Course Outcome

- **Advanced Drawing and Editing Techniques:** Exploring dynamic blocks, parametric constraints, and advanced object snapping.
- **3D Modeling and Visualization:** Creating 3D solid, surface, and mesh models, and rendering designs for presentation.
- **Customization and Automation:** Developing custom tool palettes, macros, and scripts for streamlined workflows.
- **Collaboration and Data Management:** Utilizing external references, managing project files, and working with advanced plotting options.

Course Outline: The course comprises **40-hours** of theory and labs and is divided into **19** different chapters. Each chapter will be followed by hands-on lab exercises to reinforce learning and gauge understanding of the topics covered.

Chapter 1. Adding Constraints to Sketches

Introduction
Adding Geometric Constraints
- Applying the Horizontal Constraint
- Applying the Vertical Constraint
- Applying the Coincident Constraint
- Applying the Fix Constraint
- Applying the Perpendicular Constraint
- Applying the Parallel Constraint
- Applying the Collinear Constraint
- Applying the Concentric Constraint
- Applying the Tangent Constraint
- Applying the Symmetric Constraint
- Applying the Equal Constraint
- Applying the Smooth Constraint

Controlling the Display of Constraints
Applying Constraints Automatically
Applying Dimensional Constraints
Converting a Dimensional Constraint into an Annotational Constraint
Concept of a Fully-Defined Sketch
- Under-defined
- Fully-defined
- Over-defined

Controlling the Display of the Dimensional Constraint
Working with Equations
- Adding Equations while Applying Dimensional Constraints
- Adding Equations Using the Parameters Manager

Chapter 2. Understanding External References

External References
Dependent Symbols
Managing External References in a Drawing
- Attaching an Xref Drawing (Attach Option)
- Detaching an Xref Drawing (Detach Option)
- Updating an Xref Drawing (Reload Option)
- Unloading an Xref Drawing (Unload Option)
- Adding an Xref Drawing (Bind Option)

The Overlay Option
Attaching Files to a Drawing
Working with Underlays

- Editing an Underlay

Opening an Xreffed Object in a Separate Window
Using the Design Center to Attach a Drawing as an Xref
Adding Xref Dependent Named Objects
Clipping External References
Displaying Clipping Frame
Demand Loading
Editing References In-Place

Chapter 3. Working with Advanced Drawing Options

Understanding the Use of Multilines
Defining a Multiline Style
Drawing Multilines
Editing Multilines by Using Grips
Editing Multilines by Using Dialog Box

- Cross Intersection (CC/OC/MC)
- Tee Intersection (CT/OT/MT)
- Corner Joint (CJ)
- Adding and Deleting Vertices (AV/DV)
- Cutting and Welding Multilines (CS/CA/WA)

Creating Revision Clouds

- Rectangular Revision Cloud
- Polygonal Revision Cloud
- Freehand Revision Cloud

Creating Wipeouts
Creating NURBS
Editing Splines
Editing Splines using 3D Edit Bar
Markup Import and Markup Assist Features
DWG Compare

Chapter 4. Grouping and Advanced Editing of Sketched Objects

Grouping Sketched Objects Using the Object Grouping Dialog Box
Grouping Sketched Objects Using the Group Button
Selecting Groups
Changing Properties of an Object
Exploding Compound Objects
Editing Polylines

- Editing Single Polyline
- Editing Multiple Polylines

Undoing Previous Commands
Reversing the Undo Operation
Renaming Named Objects
Removing Unused Named Objects
- Purgeable items Tab
- Find non-Purgeable items Tab

Setting Selection Modes Using the Options Dialog Box

Chapter 5. Working with Data Exchange & Object Linking and Embedding

Understanding the Concept of Data Exchange in AutoCAD
Creating Data Interchange (DXF) Files
- Creating a Data Interchange File
- Information in a DXF File
- Converting DXF Files into Drawing Files
- Importing CAD Files

Other Data Exchange Formats
- DXB File Format
- Creating and Using an ACIS File
- Importing PDF Files
- Importing 3D Studio Files
- Creating and Using a Windows Metafile
- Creating and Using a V8 DGN File
- Creating a BMP File

Raster Images
- Attaching Raster Images
- Managing Raster Images

Editing Raster Image Files
- Clipping Raster Images
- Adjusting Raster Images
- Modifying the Image Quality
- Modifying the Transparency of an Image
- Controlling the Display of Image Frames

Changing the Display Order
- Other Editing Operations
- Scaling Raster Images

DWG Convert
- Conversion Setup Options

Working with PostScript Files
Object Linking and Embedding (OLE)

Sharing Drawing Views

Chapter 6. The User Coordinate System

The User Coordinate System (UCS)
Controlling the Visibility of the UCS Icon
Defining the New UCS
Managing the UCS through the Dialog Box
System Variables

Chapter 7. Getting Started with 3D

Starting Three-Dimensional (3D) Modeling in AutoCAD
Use of Three-dimensional Drawing
Types of 3D Models

- Wireframe Models
- Surface Models
- Solid Models

Conventions Followed in AutoCAD
Changing the Viewpoint to View 3D Models

- Changing the Viewpoint Using the ViewCube
- Changing the Viewpoint Using the Ribbon or the Toolbar
- Changing the Viewpoint Using the Viewpoint Presets Dialog Box
- Changing the Viewpoint Using the -VPOINT Command

In-Canvas Viewport Control
3D Coordinate Systems
Direct Distance Entry Method
Trim, Extend, and Fillet Tools
Setting Thickness and Elevation for New Objects

- The ELEV Command

Suppressing the Hidden Edges
Creating a 3D Polyline
Converting Wireframe Models into Surface Models

- Creating 3D Faces
- Creating Polyface Meshes
- Controlling the Visibility of the 3D Face Edges

Creating Planar Surfaces
The 3DMESH Command
Editing the Surface Mesh

- The Edit Polyline Tool

Dynamic Viewing of 3D Objects

- Using the SteeringWheels

- Dynamically Rotating the View of a Model
- Clipping the View of a Model Dynamically

Nudge Functionality

Chapter 8. Creating Solid Models

What is Solid Modeling?
Creating Predefined Solid Primitives

- Creating a Solid Box
- Creating a Solid Cone
- Creating a Solid Cylinder
- Creating a Solid Sphere
- Creating a Solid Torus
- Creating a Solid Wedge
- Creating a Pyramid
- Creating a Polysolid
- Creating a Helix

Modifying the Visual Styles of Solids
Creating Complex Solid Models

- Creating Regions

Creating Complex Solid Models by Applying Boolean Operations

- Combining Solid Models
- Subtracting One Solid From the Other
- Intersecting Solid Models
- Checking Interference in Solids

Dynamic UCS
Defining the New UCS Using the ViewCube and the Ribbon
Creating Extruded Solids

- Extruding along the Normal
- Extruding with a Taper Angle
- Extruding along a Direction
- Extruding along a Path
- Extruding using Expressions

Creating Revolved Solids
Creating Swept Solids
Creating Lofted Solids
Creating Presspull Solids

Chapter 9. Editing 3D Objects-I

Filleting Solid Models
Chamfering Solid Models

Rotating Solid Models in 3D Space
Rotating Solid Models about an Axis
Mirroring Solid Models in 3D Space
Moving Models in 3D Space
Creating Arrays in 3D Space
Aligning Solid Models
Aligning Solids by Defining an Alignment Plane
Extracting Edges of a Solid Model
Converting Objects to Surfaces
Converting Objects to Solids
Converting Surfaces to Solids
Point Cloud
- Attaching the Point Cloud

Slicing Solid Models
Creating the Cross-Sections of Solids

Chapter 10. Editing 3D Objects-II

Editing Solid Models
- Editing Faces of a Solid Model
- Editing Edges of a Solid Model
- Editing Entire Body of a Solid Model

Generating a Section by Defining a Section Plane
Solid History
Generating Drawing Views of a Solid Model
- Solid View
- Solid Drawing
- Solid Profile

Drawing Views
- Base
- Projected View
- Edit View
- Update View
- Auto Update
- Drafting Standard
- Generating Section Views

Creating Flatshot
Calculating the Mass Properties of Solid Models
Recording the Drawing Steps by Using the Action Recorder
Using ShowMotion for Presentation
- Playing the Animation

Chapter 11. Surface Modeling

Surface Modeling
Creating Wireframe Elements
- Spline CV
- Spline Fit
- Spline Freehand
- Extract Isoline Curves

Creating Surfaces by Using Profiles
- Creating an Extruded Surface
- Creating a Revolved Surface
- Creating a Loft Surface
- Creating a Sweep Surface
- Creating a Planar Surface
- Creating a Network Surface

Creating Surfaces from other Surfaces
- Creating a Blend Surface
- Creating a Patch Surface
- Creating an Offset Surface

Editing Surfaces
- Creating Fillets
- Trimming Surfaces
- Untrimming Surfaces
- Extending Surfaces
- Sculpting Surfaces
- Extracting Intersections
- NURBS Surfaces
- Projecting Geometries

Performing Surface Analysis
- Zebra
- Analysis Curvature
- Analysis Draft

Chapter 12. Mesh Modeling

Introduction
Creating Mesh Primitives
- Creating a Mesh Box

Creating Surface Meshes

- Creating Revolved Surface Meshes
- Creating Edge Surface Meshes
- Creating Ruled Surface Meshes
- Creating Tabulated Surface Meshes

Modifying Mesh Objects

- Adding Smoothness to Meshes
- Refining the Meshes
- Adding Crease to Meshes

Editing Mesh Faces

- Splitting the Mesh Faces
- Extruding the Mesh Faces
- Merging the Mesh Faces
- Closing the Gaps
- Collapsing the Mesh Vertices
- Spinning the Edges of Triangular Faces

Converting Mesh Objects

- Converting Mesh Objects into Solids
- Converting Mesh Objects into Surfaces

Working with Gizmos

- Move Gizmo
- Rotate Gizmo
- Scale Gizmo

Chapter 13. Rendering and Animating Designs

Understanding the Concept of Rendering

Assigning Materials

- Materials Browser
- Assigning Selected Materials to Objects
- Attaching Material by Layers
- Creating and Editing Materials

Basic Rendering

Creating New Materials

Mapping Materials on Objects

Converting Materials Created in Previous AutoCAD Release into

- AutoCAD Format

Adding Lights to the Design

- Default Light
- Point Light
- Spotlight
- Distant Light

- Web Light
- Sun Light

Converting Lights Created in AutoCAD's Previous Release into

- AutoCAD Format

Modifying Lights
Understanding Rendering Presets
Controlling the Rendering Environment

- Rendering with a Background
- Adjusting the Lighting Exposure to Rendered Image

Rendering a Model with Different Render Settings
Obtaining Rendering Information
Saving a Rendered Image

- Saving the Rendered Image to a File
- Saving the Viewport Rendering
- Saving the Rendered Image from the Render Window

Plotting Rendered Images
Unloading AutoCAD Render
Working with Cameras

- Create Camera
- Editing the Cameras

Creating Animations

- Creating Animation of 3D Navigations
- Creating Animation by Defining the Path of the Camera Movement

Chapter 14. Rendering and Animating Designs

Introduction

- BROWSER
- HYPERLINK
- HYPERLINKFWD
- HYPERLINKBACK
- HYPERLINKSTOP
- PASTEASHYPERLINK
- HYPERLINKBASE

Internet Commands
Understanding URLs

- Launching a Web Browser
- Changing the Default Website

Using Hyperlinks with AutoCAD
Pasting as Hyperlink
Editing Hyperlinks

Removing Hyperlinks from Objects
The Drawing Web Format
Creating a DWF File
3D Printing

Chapter 15. Script Files and Slide Shows

What Are Script Files?
Running Script Files
Repeating Script Files
Introducing Time Delay in Script Files
Resuming Script Files
Command Line Switches
Running a Script File while Loading AutoCAD
What is a Slide Show?
What are Slides?
Creating Slides
Viewing Slides
Preloading Slides
Slide Libraries

Chapter 16. Creating Linetypes and Hatch Patterns

Standard Linetypes
Linetype Definitions
Elements of Linetype Specification
Creating Linetypes
Alignment Specification
LTSCALE Command
LTSCALE Factor for Plotting
Current Linetype Scaling (CELTSCALE)
Alternate Linetypes
Modifying Linetypes
Complex Linetypes
Creating a String Complex Linetype
Hatch Pattern Definition
How Hatch Works?
Simple Hatch Pattern
Effect of Angle and Scale Factor on Hatch
Hatch Pattern with Dashes and Dots
Hatch with Multiple Descriptors
Saving Hatch Patterns in a Separate File

Custom Hatch Pattern File

Chapter 17. Customizing the acad.pgp File

What is the acad.pgp File?
Sections of the acad.pgp File
Reinitializing the acad.pgp File

Chapter 18. Conventional Dimensioning and Projection Theory Using AutoCAD

Dimensioning
Dimension Units
Dimensioning Components
Common Rules for Dimensioning
Working Drawings
- Detail Drawing
- Assembly Drawing

Bill of Materials
Multiview Drawings
Understanding the X, Y, and Z Axes
Orthographic Projections
Positioning Orthographic Views
Sectional Views
- Full Section
- Half Section
- Broken Section
- Revolved Section
- Removed Section
- Offset Section
- Aligned Section
- Cutting Plane Lines
- Spacing for Hatch Lines
- Direction of Hatch Lines
- Points to Remember

Auxiliary Views

Chapter 19. Isometric Drawings

Isometric Drawings
Isometric Projections
Isometric Axes and Planes
Setting the Isometric Grid and Snap
Drawing Isometric Circles
- Creating Fillets in Isometric Drawings
- Dimensioning Isometric Objects

Isometric Text