Course Syllabus

AutoCAD 3D

Course Description

This course explores the three-dimensional viewing and construction capabilities of AutoCAD. Topics covered include a review of point coordinate entry and the user coordinate system (UCS). Spherical and cylindrical coordinate entry, 3D viewing techniques, 3D geometry construction, solid modeling surface meshes, and regions are also introduced. The use of multiple viewports for 3D constructions and a standard engineering layout are covered. The creation of presentation graphics using bitmap files, shading, and rendering is also discussed.

Objectives

After completing this course, the student will be able to:

- Define and maintain user-defined coordinate systems to aid in the construction of 3D objects.
- Create and use model space viewports.
- Create a standard engineering layout.
- Extract two-dimensional views from a three-dimensional model for detail drafting.
- Create and edit simple 2D regions and 3D solid models.
- Use a variety of 3D display techniques.
- Create 3D surface models using a variety of techniques.
- Identify the various types of surface meshes and applications for each.
- Generate 3D text and dimensions.
- Render a 3D model with a variety of lights and materials.

Course Length

Seventy-two (72) term or semester hours (recommended minimum).

Prerequisite

Computer-Aided Drafting I and Computer-Aided Drafting II, or equivalent training or experience with AutoCAD 2D drawing and editing. A basic knowledge of Microsoft Windows is also required.

Required Text

AutoCAD and its Applications—Advanced by Shumaker and Madsen, Goodheart-Willcox Co., Inc. Chapters 1–17 are covered in this syllabus.

Required Materials

Removable storage media, such as floppy disk, Zip disk, or CD-RW.

Course Outline

Session	Topics and Commands
1	Chapter 1. Using rectangular 3D coordinates, the right-hand rule of drawing, displaying 3D views, 3D construction techniques, constructing wireframe objects, and constructing solid primitives. **Commands: PLAN**, **UCS**, **3DORBIT**, **HIDE**, **BOX**, **SPHERE**, **CYLINDER**, **CONE**, **WEDGE**, and **TORUS**. **Resources:** Chapter exercises on the Student CD, chapter test, and drawing problems. Chapter 2. Spherical coordinates, cylindrical coordinates, 3D polylines, working with the UCS, constructing accurate intersections, and guidelines for working with 3D models. **Commands: 3DPOLY** and **UCS**. **Resources:** Chapter exercises on the Student CD, chapter test, and drawing problems.
2	Chapter 3. Introduction to user coordinate systems, working with user coordinate systems, additional ways to change the UCS, managing user coordinate systems and displays, creating text with thickness, text and the UCS, and dimensioning in 3D. **Commands and variables: UCS**, **UCSICON**, **DDUCSP**, **UC**, **UCSMAN**, **UCSFOLLOW**, and **PROPERTIES**. **Resources:** Chapter exercises on the Student CD, chapter test, and drawing problems.

Session	Topics and Commands
3	Chapter 4. Understanding viewports, creating viewports, drawing in multiple viewports, regenerating viewports, and creating a standard engineering layout. **Commands and variables: VPORTS**, **MVIEW**, **CVPORT**, **UCSVP**, and **REGENALL**. **Resources:** Chapter exercises on the Student CD, chapter test, and drawing problems. Chapter 5. **PLAN** command options, dynamically changing a 3D view, and shading a 3D model. **Commands and variables: PLAN**, **3DORBIT**, **3DDISTANCE**, **3DSWIVEL**, **3DCLIP**, **3DCORBIT**, **SHADEMODE**, and **RENDER**. **Resources:** Chapter exercises on the Student CD, chapter test, and drawing problems.
4	Chapter 6. Overview of solid modeling, constructing solid primitives, creating composite solids, and working with regions. **Commands: BOX**, **SPHERE**, **CYLINDER**, **CONE**, **WEDGE**, **TORUS**, **SUBTRACT**, **UNION**, **INTERSECT**, **INTERFERE**, **REGION**, **BOUNDARY**, and **AREA**. **Resources:** Chapter exercises on the Student CD, chapter test, and drawing problems.
5	Chapter 7. Creating solid model extrusions, creating solid model revolutions, and using the **EXTRUDE** and **REVOLVE** commands as construction tools. **Commands: EXTRUDE** and **REVOLVE**. **Resources:** Chapter exercises on the Student CD, chapter test, and drawing problems.
6	Chapter 8. Changing properties, aligning objects in 3D, 3D rotating, 3D mirroring, creating 3D arrays, filleting solid objects, chamfering solid objects, constructing details and features on solid models, and removing details and features. **Commands: PROPERTIES**, **ALIGN**, **ROTATE3D**, **MIRROR3D**, **3DARRAY**, **FILLET**, and **CHAMFER**. **Resources:** Chapter exercises on the Student CD, chapter test, and drawing problems.
7	Chapter 9. Overview of solid model editing, face editing, edge editing, body editing, and using **SOLIDEDIT** as a construction tool. **Commands: SOLIDEDIT**. **Resources:** Chapter exercises on the Student CD, chapter test, and drawing problems.

Session	Topics and Commands
8	Chapter 10. Controlling solid model display, viewing the internal features of a solid model, creating and using multiview layouts, solid model analysis, and solid model file exchange. **Commands and variables: ISOLINES**, **DISPSILH**, **FACETRES**, **SECTION**, **SLICE**, **SOLVIEW**, **SOLDRAW**, **AMECONVERT**, **SOLPROF**, **MASSPROP**, **ACISOUT**, **EXPORT**, **ACISIN**, **IMPORT**, and **STLOUT**. **Resources:** Chapter exercises on the Student CD, chapter test, and drawing problems.
9	Chapter 11. Overview of surface modeling, creating 3D faces, creating invisible 3D face edges, and drawing surface primitives. **Commands: 3DFACE**, **AI_BOX**, **AI_WEDGE**, **AI_PYRAMID**, **AI_CONE**, **AI_DOME**, **AI_DISH**, **AI_SPHERE**, and **AI_TORUS**. **Resources:** Chapter exercises on the Student CD, chapter test, and drawing problems.
10	Chapter 12. 3D mesh techniques, constructing a 3D mesh, constructing a single-plane mesh, constructing a 3D polyface mesh, polygon mesh variations, constructing enclosed surfaces with **EDGESURF**, creating a surface mesh with **RULESURF**, constructing tabulated surfaces with **TABSURF**, constructing revolved surfaces with **REVSURF**, drawing wireframe holes, and surfacing around wireframe holes. **Commands: 3DMESH**, **AI_MESH**, **PFACE**, **EDGESURF**, **RULESURF**, **TABSURF**, and **REVSURF**. **Resources:** Chapter exercises on the Student CD, chapter test, and drawing problems.
11	Chapter 13. Using grips to edit surface models, trimming and extending objects in 3D, creating surfaced fillets and rounds, editing polygon meshes, and editing polygon meshes with grips. **Commands: TRIM**, **EXTEND**, **EDGE**, and **PEDIT**. **Resources:** Chapter exercises on the Student CD, chapter test, and drawing problems.
12	Chapter 14. Lights, creating scenes, rendering models, and rendering preferences and statistics. **Commands: LIGHT**, **SCENE**, **RENDER**, **RPREF**, and **STATS**. **Resources:** Chapter exercises on the Student CD, chapter test, and drawing problems.
13	Chapter 15. Creating surface finishes with materials; granite, marble, and wood; assigning materials to objects; using maps; mapping textures to objects; and material libraries. **Commands: RMAT**, **SETUV**, and **MATLIB**. **Resources:** Chapter exercises on the Student CD, chapter test, and drawing problems.

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14	Chapter 16. Setting the icon scale, properties of lights, AutoCAD lights, shadows, simulating sunlight, adding a background, adding atmospheric fog, and landscaping (entourage). **Commands: RPREF**, **BACKGROUND**, **FOG**, **LSNEW**, **LSEDIT**, and **LSLIB**. **Resources:** Chapter exercises on the Student CD, chapter test, and drawing problems.
15	Chapter 17. Introduction to raster and vector graphics, replaying image files, working with raster files, and working with vector files. **Commands: REPLAY**, **IMAGE**, **IMAGEATTACH**, **IMAGECLIP**, **IMAGEADJUST**, **IMAGEQUALITY**, **TRANSPARENCY**, **IMAGEFRAME**, **SAVEIMG**, **SAVEAS**, **DXFOUT**, **OPEN**, **DXFIN**, **EXPORT**, **WMFOUT**, **IMPORT**, and **WMFIN**. **Resources:** Chapter exercises on the Student CD, chapter test, and drawing problems.