

Course Syllabus

ATC Course

3D Modeling and Rendering

Course Description

This course explores the three-dimensional viewing and construction capabilities of AutoCAD. The topics include a review of point coordinate entry and the user coordinate system (UCS). Spherical and cylindrical coordinate entry, 3D viewing techniques, solid modeling, solid model editing, 3D geometry construction, surface meshes, and regions are introduced. Other course topics include the use of model space and multiple viewports for 3D constructions and using bitmap files, shading, and rendering for presentation graphics.

Objectives

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

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

Course Length

Two weeks of 16 hours per week for a total of 32 hours (two credits). Each class session is four hours long. Four class sessions are scheduled for lecture, demonstration, and activities. Four class sessions are designated as open lab. Students are encouraged to use equipment at school, home, or their office.

Prerequisite

AutoCAD Level I and AutoCAD Level II. Equivalent training or experience with AutoCAD 2D drawing and editing can also be used to fulfill the prerequisite. Prior experience with Microsoft Windows is helpful, but not required.

Required Text

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

Required Materials

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

Course Outline

Session	Topics and Commands
1	<p>Chapters 1 through 5. Introduction to 3D drawing, 3D coordinates and constructions, understanding user coordinate systems, using model space viewports, and viewing and displaying 3D models.</p> <p>Commands and variables: UCS, 3DORBIT, HIDE, 3DPOLY, UCS, UCSICON, DUCSSP, UC, USCMAN, UCSFOLLOW, PROPERTIES, VPORTS, MVIEW, CVPORT, UCSVP, REGENALL, PLAN, 3DORBIT, 3DDISTANCE, 3DSWIVEL, 3DCLIP, 3DCORBIT, SHADEMODE, and RENDER.</p> <p>Assignment: Read Chapters 1 through 5.</p> <p>Exercises: 1-1, 1-2, 1-3, 1-4, 1-5, 2-1, 2-3, 3-1, 3-2, 3-3, 3-4, 4-1, 4-2, 5-1, 5-2, 5-3 on the Student CD.</p> <p>Problems: 1-4, 1-8, 1-10, 2-2 or 2-4, 2-11, 2-13 or 2-15, 3-1, 3-2, 3-7, 4-1, and 5-2.</p>
2	<p>Chapters 6 through 10. Introduction to solid modeling, solid extrusions and revolutions, solid modeling details, solid model editing, and solid model display and analysis.</p> <p>Commands and variables: BOX, SPHERE, CYLINDER, CONE, WEDGE, TORUS, SUBTRACT, UNION, INTERSECT, INTERFERE, REGION, BOUNDARY, AREA, EXTRUDE, REVOLVE, PROPERTIES, ALIGN, ROTATE3D, MIRROR3D, 3DARRAY, FILLET, CHAMFER, SOLIDEDIT, ISOLINES, DISPSILH, FACETRES, SECTION, SLICE, SOLVIEW, SOLDRAW, AMECONVERT, SOLPROF, MASSPROP, ACISOUT, EXPORT, ACISIN, IMPORT, and STLOUT.</p> <p>Assignment: Read Chapters 6 through 10.</p> <p>Exercises: 6-1, 6-2, 6-3, 6-4, 7-1, 7-2, 8-1, 8-2, 8-3, 8-4, 9-1, 9-2, 9-3, 9-4, 9-5, 9-7, 10-1, 10-2, 10-3, 10-4, and 10-5 on the Student CD.</p> <p>Problems: 6-8, 6-14, 7-1, 7-3, 7-6, 7-9, 8-1, 8-3, 8-4, 9-1, 9-3, 9-6, 10-1, 10-2, and 10-3.</p>

Session	Topics and Commands
3	<p>Chapters 11 through 13. Introduction to surface modeling, 3D surface modeling techniques, and editing surface models.</p> <p>Commands and variables: 3DFACE, AI_BOX, AI_WEDGE, AI_PYRAMID, AI_CONE, AI_DOME, AI_DISH, AI_SPHERE, AI_TORUS, 3DMESH, AI_MESH, PFACE, EDGESURF, RULESURF, TABSURF, REVSURF, TRIM, EXTEND, EDGE, and PEDIT.</p> <p>Assignment: Read Chapters 11 through 13.</p> <p>Exercises: 11-1, 11-2, 12-1 on the Student CD.</p> <p>Problems: 11-2, 11-4, 12-1, 12-2, 13-1, 13-4, and 13-6.</p>
4	<p>Chapters 14 through 17. Lights, scenes, and rendering; materials in AutoCAD; advanced lighting, atmospheres, and landscaping; and using raster and vector graphics.</p> <p>Commands: LIGHT, SCENE, RENDER, RPREF, STATS, RMAT, SETUV, MATLIB, BACKGROUND, FOG, LSNEW, LSEdit, LSLIB, REPLAY, IMAGE, IMAGEATTACH, IMAGECLIP, IMAGEADJUST, IMAGEQUALITY, TRANSPARENCY, SAVEIMG, SAVEAS, DXFOUT, OPEN, DXFIN, EXPORT, WMFOUT, IMPORT, and WMFIN.</p> <p>Assignment: Read Chapters 14 through 17.</p> <p>Exercises: 14-1, 14-2, 14-5, 14-6, 15-1, 15-2, 15-3, 15-4, 15-7, 15-8, 16-1, 16-2, 16-3, 16-4, 16-5, 16-6, 17-1, and 17-2 on the Student CD.</p> <p>Problems: 14-1, 14-3, 15-1, 15-2, 15-5, 16-2, 16-4, 17-2, and 17-4.</p>