

Computer Assisted Drafting (CAD) Level I & II

Program Description:

The Computer Assisted Drafting program prepares students for successful careers beginning as entry level design drafters in Architectural, Engineering, or Artistic fields. The program includes instruction in basic construction and structural design, architectural rendering, industrial design and blueprint reading and interpretation. Students have an opportunity to sit for the any of the Auto Desk or Solid Works User certification exams. Students need to have completed coursework in geometry and be fluent with the use of a computer to be successful in the CAD pathway of study.

Level I

Manual Drafting

Unit 1: Free Hand Sketching Techniques

Unit Competencies:

1. Demonstrate proficiency in how to sketch quickly.
2. Explore box drawing as a sketch technique.
3. Demonstrate competency in drawing with a clear piece of plastic on a window to re-enforce the concepts of vanishing lines and perspective.
4. Demonstrate an understanding of basic Shade and Shadow techniques.
5. Demonstrate an understanding of basic hatching techniques as a method to speed-up the areas of dark and light fill in a sketch.
6. Explore squinting as a technique for viewing objects.
7. Students will draw many different sketches to solidify the sketch technique of any given week.
8. Students will submit some of the sketches for a grade, and a progression showing improvement.
9. Students will submit a collection of free-hand sketches in a portfolio.

Drafting Fundamentals using Auto CAD

Unit 1: User Interface/File Management

Unit Competencies:

1. Demonstrate competency in how to save files, keep files separated, and proper file storage techniques.
2. Demonstrate competency in how to save a User Profile in Auto CAD.
3. Demonstrate proficiency in accessing the CAD share file on the local network.

Unit 2: Orthographic Projection

Unit Competencies:

1. Demonstrate knowledge of orthographic projection drawings on the computer (compared to paper drawings in the manual drafting part of the course).
2. Demonstrate an understanding of the comparison between manual and computer-aided drafting styles.
3. Demonstrate an understanding of the X, Y, Z coordinate system (the World Coordinate System- or WCS).
4. Define and discuss the concepts of limits, units, snap, grid, and working in 2d planes.
5. Demonstrate knowledge of the use of command line and shortcut or hot keys.

Unit 4: Object Snap

Unit Competencies:

1. Demonstrate knowledge of basic geometric principals as they relate to the object snap toolbar.
2. Define and discuss endpoints, midpoints, circle center points, intersections of lines, lines perpendicular to each other, tangency of lines, etc. as they apply to the object snap toolbar.
3. Demonstrate an understanding of how the Object Snap toolbar increases drafting speed.
4. Demonstrate proficiency in using key board short cuts to increase drawing productivity.
5. Demonstrate competency using ribbon toolbars and icons.
6. Demonstrate an understanding of concepts through the completion of basic 2d drawings using object snap symbols and principles.

Unit 5: The Draw Toolbar

Unit Competencies:

1. Demonstrate familiarity of various icons on the ribbon toolbar, and also keyboard hot keys to draw items such as rectangles, polygons, and ellipses.
2. Define and discuss construction lines, splines, arcs, hatch, and various other icons on the Draw toolbar.
3. Demonstrate competency by completing basic 2d drawings using the principles behind the Draw toolbar.
4. Demonstrate the retention and application of information about icons, shortcuts, and how to devise ways to increase their productivity in drawings related to the Draw toolbar.

Unit 6: Basic Modify Options

Unit Competencies:

1. Demonstrate proficiency in utilizing modifying techniques from the Properties Manager, to any icon on the Modify toolbar such as Trim, Extend, Move, Offset, etc.
2. Demonstrate competency in using various editing commands in the program for editing mistakes, or items already drawn.

Unit 7: Formatting and Text Styles

Unit Competencies

1. Demonstrate the ability to create various text styles using different fonts and properties of the styles.
2. Create tables and how to manipulate the data within a table using Auto CAD.
3. Create point styles, dimension styles, multi line styles from the format pull-down menu or from the various ribbon menus.

Unit 8: Modify Toolbar

Unit Competencies:

1. Demonstrate proficiency in using basic editing commands.
2. Define and discuss stretch, and move using displacement from one point to another point.
3. Demonstrate knowledge of layers, line types, colors, and line weights.
4. Distinguish between a true stretch and a move command and the outcome on the screen.
5. Increase drawing accuracy by using good editing techniques.

Unit 9: Blocks

Unit Competencies:

1. Demonstrate an understanding of blocks, wblocks, and block libraries and the usefulness of blocks in drawings.
2. Demonstrate proficiency in block editing, insertions, and re-defining blocks.
3. Demonstrate competency of copy and paste as a quick method for block creation.

Unit 10: The Inquiry Toolbar

Unit Competencies:

1. Define and discuss terms and commands for distance, perimeter, area, list, and point on the Inquiry toolbar.
2. Discuss and explain when to use various options on Inquiry toolbar.
3. Demonstrate proficiency in using toolbar to discover information about drawings.
4. Demonstrate proficiency in completing various drawings to find area, perimeter, distance, length, or other information within the database of a drawing.

Unit 11: Dimensions

Unit Competencies:

1. Demonstrate proficiency in how to use the Dimension Compare option when creating a new Dim Style.
2. Complete a large scale drawing using various dimension styles within the drawing.
3. Modify or edit any dimension style; change text, line colors, text height, and arrow heads within any drawing.

Unit 12: Layouts and Viewports

Unit Competencies:

1. Define and discuss model and paper space, layout tabs, and viewports.
2. Define and discuss layout tabs and their purpose in plotting drawings.
3. Define and discuss viewports and how they can be manipulated on a plotting sheet.
4. Define and discuss dimensions on viewports, and how they can be controlled by layers.
5. Define and discuss scaling viewports and how this affects scaled drawings when plotted.
6. Demonstrate competency in the fine tuning and manipulations to hide viewport lines, and freezing aspects of drawings in one viewport, while being able to see the same information in another viewport.
7. Demonstrate ability to apply all principles of model and paper space, layouts, and viewports when plotting drawings of various sheet sizes.

Advanced 3d Auto CAD

Unit 1: Ribbons and the User Interface

1. Define terms related to 3d Basics, 3d Modeling, and Auto CAD Classic User Interfaces.
2. Complete a 2dimensional Isometric Drawing using the techniques introduced by the instructor.
3. Complete a 2 dimensional Auxiliary View Drawing using the techniques introduced by the instructor.
4. Complete a basic 3 dimensional object using the manipulation of the User Coordinate System and the UCS icon.
5. Demonstrate the ability to move the UCS to various planes of a 3d solid model.

Unit 2: Solid Primitives

Unit Competencies:

1. Demonstrate an understanding of Solids and Surfaces ribbons.
2. Demonstrate knowledge of basic creation and manipulation of solids from within the Auto CAD program.
3. Accurately complete a basic 3d solid primitive.

Unit 3: Regions, Splines, Polylines, P-Edit, and the Boolean Operation

Unit Competencies:

1. Demonstrate an understanding of closing 2d shapes so they can become 3d solids or surface objects (P-Edit).
2. Demonstrate an understanding of Regions and manipulating Regions by Union, Intersection, and Subtraction.
3. Create primitive Helix shapes.

Unit 4: Creating different types of 3d Solids

Unit Competencies:

1. Demonstrate proficiency in ability to draw any shape and determine how it should be created using Extrusions, Revolved shapes, or manipulated using the Boolean Operations of Union, Intersection, and Subtraction.
2. Demonstrate ability to dimension all models created in 3d solid form.
3. Accurately plot using multiple views of their 3d solid models.
4. Demonstrate proficiency in being able use standardized views, labeling, and dimensioning techniques so their drawings are clear and understandable to anyone who looks at their work.

Unit 5: Editing and Modifying 3d Solids

Unit Competencies:

1. Demonstrate an understanding of Fillets and Chamfers on 3d solid models.
2. Demonstrate mastery of the concept of finding the Mass Properties of a 3d solid and the value to engineers in the design process of any solid (for prototyping).
3. Demonstrate an understanding of the 3d Move, 3d Rotate, 3d Align, 3d Mirror, and 3d Array commands.

Unit 6: Solid Editing

Unit Competencies:

1. Demonstrate an understanding of how to manipulating 3d Faces of 3d Solid objects.
2. Define and discuss Shell, Imprint, and Copy Edge commands.

Unit 7: The Engine Project

Unit Competencies:

1. Demonstrate an understanding of a complex step-by-step method for modeling a four cylinder engine in Auto CAD.
2. Define and discuss modeling 3d Solid Parts using Auto CAD.
3. Define and discuss putting an Assembly of Parts into a drawing in this project.
4. Demonstrate proficiency of applying CAD to an Engine Model and plotting it in the various views.

Unit 8: House Model Project

Unit Competencies:

1. Demonstrate proficiency of 3d Solids and using them as Blocks, then manipulating them in an Assembly file.
2. Demonstrate proficiency in utilizing visual styles such as Wireframe, Hidden, or Shaded views of 3d solids.
3. Demonstrate proficiency at successfully creating all of the solid models.
4. Accurately complete a solid house model of the house and plot it using 3dSolid techniques.

Unit 9: Loft, Thicken, Sweep

Unit Competencies:

1. Define and discuss the Loft process in 3d Solid modeling.
2. Demonstrate proficiency in the use of the Thicken command to modify a 3d Solid model.
3. Define and discuss the Sweep process of 3d Solid modeling.
4. Demonstrate proficiency in applying the vocabulary used in solid modeling.
5. Demonstrate proficiency in being able to look at any reverse engineering of a model to determine how to model it using a Loft or a Sweep.

Unit 10: Propeller Project

Unit Competencies:

1. Demonstrate proficiency in the application of the concepts learned to create a step-by-step model of an airplane blade and the housing.
2. Demonstrate proficiency in using 2d applications and 3d applications together in the same project.
3. Create an assembly of the modeled parts in this project.
4. Demonstrate master in being able to follow the step-by-step procedure to complete the 2d Blade cross sections, the Blade solid model, the Hub Solid model, and assemble the propeller.

Introduction to 3d Solid Modeling with Inventor

Unit 1: Beginning Inventor to Intermediate Inventor

Unit Competencies:

1. Demonstrate an understanding of Basic Inventor Pro User Interface with Ribbon.
2. Utilize skills to create parts, assemblies, and drawings provided by the instructor.
3. Demonstrate knowledge of parametric drawings.
4. Define and discuss Explode Assembly.
5. Demonstrate an understanding of weldments and sheet metal as specialty parts.
6. Demonstrate an understanding of parameters within drawings and the efficiency of using Inventor for editing.
7. Demonstrate proficiency in using Inventor by creating a project incorporating skills learned.
8. Students will complete two projects, one the teacher provides, the other is a reverse engineered Project chosen by the students.

Introduction to Solid Modeling with Solid Works

Unit 1: Beginning Solid Works to Intermediate Solid Works

Unit Competencies:

1. Demonstrate an understanding of the Solid Works User Interface with ribbons and browser.
2. Utilize skills to create parts, assemblies, and drawings provided by the instructor.
3. Demonstrate knowledge of parametric drawings.
4. Define and discuss Exploded Assemblies.
5. Demonstrate an understanding of welding and sheet metal symbols as specialty parts.
6. Demonstrate by using relations in parametric model parts and their efficiency when editing Solid Works drawings.
7. Demonstrate proficiency in using Solid Works by creating a project incorporating the new skills learned.
8. Students will complete two projects, one the teacher provides, the other is a reverse engineered Project chosen by the students.

Introduction to Architecture by using Chief Architect**Unit 1: Beginning to use Chief Architect****Unit Competencies:**

1. Demonstrate how the Chief Architect user interface works.
2. Utilize what has been learned by watching video tutorials within the program.
3. Define and discuss the use of Building Information Modeling.
4. Define some structural architecture vocabulary as it occurs in the building model.
4. Demonstrate use of the program by modeling a sample house.
5. Students will complete one house project the teacher provides to demonstrate mastery of the program.

Level II Solid Works Review**Unit 1: Gear Box Model and Animation****Unit Competencies:**

1. Demonstrate an understanding of the vocabulary used when working with Solid Works.
2. Define and discuss the keyboard shortcuts and tool bar features.
3. Demonstrate an understanding of setting up parts, assemblies and drawing files.
4. Demonstrate proficiency of drawing from two-dimensional to basic solid models.
5. Demonstrate proficiency in using the Solid Works Tool Box.
6. Demonstrate knowledge of how to use the Photo View 360 add-on program for rendering in Solid Works.
7. Demonstrate proficiency in using dimension and edit drawing views on the drawing sheets.
8. Demonstrate ability to use ordinate dimensioning.
9. Demonstrate knowledge in inserting a rendered jpeg from Photo View 360 onto a drawing sheet.
10. Demonstrate competency in placing balloon labels on an exploded assembly sheet.
11. Demonstrate proficiency in the techniques learned in Solid Works by creating a project.

Unit 2: Reverse Engineering Model and Still Life**Unit Competencies:**

1. Demonstrate an understanding of reverse engineering as it applies to solid modeling.
2. Define and discuss basic concepts related to modeling to lighting in 3ds Max.
3. Collaborate with other students to create a project using the concepts learned.

Building Information Modeling

Unit 1: Basic Introduction to Revit

Unit Competencies:

1. Define and discuss terms and concepts related to modeling.
2. Demonstrate knowledge of how to navigate within the programs.
3. Demonstrate proficiency in constructing basic house structures.
4. Demonstrate correct dimensions of lumber, brick and other materials.
5. Demonstrate the understanding of concepts by creating a model of a home applying skills learned throughout the CAD class thus far.

Unit 2: Revit

Unit Competencies:

1. Demonstrate proficiency in utilizing the vocabulary and concepts of Revit.
2. Demonstrate ability to apply concepts by creating a model of a residential dwelling.
3. Demonstrate ability to manipulate angles and slopes.
4. Demonstrate an understanding of rendering and making materials on a model look “photo realistic”.
5. Demonstrate the ability to create a model showing elevation, cross section, and detail.
6. Demonstrate proficiency in creating a 3d walkthrough with a camera from level to level of a dwelling.
7. Demonstrate the ability to show axonometric views of a dwelling.
8. Demonstrate the ability to apply knowledge learned to create a complete set of drawings for a dwelling including utilities.

Introduction to 3ds Max

Unit 1: Basic Modeling

Unit 1: Competencies:

1. Demonstrate a basic understanding of the 3ds Max User Interface and the many tools in the program.
2. Demonstrate knowledge of the Command Panel and creating simple geometric shapes.

Unit 2: Basic Materials

Unit 2: Competencies:

1. Demonstrate understanding of the Materials Manager, and how to put surface materials for realistic appearances on models or scenes.
2. Demonstrate proficiency by obtaining materials from the Materials Library, and manipulating them on objects in the scenes.
3. Demonstrate proficiency by using different types of materials such as jpegs, bit maps, and images to be used as materials.
4. Manipulate surface bump, glossiness, scale, or other aspects of materials to appear more realistic.
5. Demonstrate an understanding of principles by creating projects utilizing techniques learned.

Unit 3: Basic Movement on Time Line

Unit Competencies:

1. Demonstrate mastery of Stretch and Squash concepts with a sphere, the time configuration panel and Key frame animation tools.
2. Complete the Hair Dryer Project with wind modifier and light glow effects to simulate a flag moving as well as the end of the dryer to appear as if hot.
3. Complete the Watch project as if it appears to be swinging back and forth in the scene with the hands on the watch moving as it goes back and forth.

Unit 4: Basic Lighting

Unit Competencies:

1. Demonstrate an understanding of basic use of Omni, Spot, and other direct lighting tools in a scene.
2. Demonstrate an understanding of the different lights and how they affect rendering time in a scene.
3. Demonstrate how to modify lights in a scene by color, intensity, or by attenuation.
4. Demonstrate how lighting is influenced by an environment.

Unit 5: Basic Animation Techniques

Unit Competencies:

1. Demonstrate knowledge of key frame animation (frame by frame) and some effects that can be done using this technique.
2. Demonstrate proficiency in animation of objects using a path and target—used in fly-arounds to show what an object looks like in a simple scene.
3. Define and discuss simple movement of objects with the animate button in the “on” position, and how the transitions show.
4. Define and discuss concepts of simple doors, windows, and features in the program that already can be animated in a scene—such as a door opening as the camera would move into a house.
5. Demonstrate competencies in skills related to basic animation concepts by completion of a project.

Unit 6: Rendered output files

Unit Competencies:

1. Demonstrate how to render a scene of a certain speed and length to a format easily seen on any computer or video device.
2. Define and discuss the Time Configuration icon and the options for setting up playback speed, frame rate, and start and end lengths of the animation.
3. Demonstrate how to use the Render toolbar and setting up what is being rendered, how big the image size should be, and where to save the output files.
4. Demonstrate competency in rendered output files and Audio Video Interleaved format by completing a project.

Senior Capstone Project

Unit 1: Comprehensive Project

Unit Competencies:

1. Demonstrate the ability to apply skills learned within the Computer Assisted Drafting course of study by completing a major project of choice in a specific focus/interest of the student.
2. Demonstrate proficiency by using one of many of the programs learned to complete a group project with a particular vocational emphasis: Architecture, Industrial Design, Engineering, or 3dAnimation.
3. Demonstrate mastery of skills and concepts learned by working in conjunction with other construction trades during the building process.

Certifications Offered: Auto CAD User, Inventor User, 3ds Max User, Solid Works User Certifications

Articulation Agreements: College of Southern Maryland