



## Northern York County School District

### Curriculum Overview

**Course: Computer-Aided Drafting & Design**

**Grade Level: 9-12**

**Approval Date: March 2023**

**Length of Time: 90 days / 0.5 credits**

**Course Description:**

This course builds on Introduction to Engineering.

Computer-Aided Drafting & Design is a semester-long course focusing on 3-D software design for applications in engineering and manufacturing. This course is designed for students who are interested in engineering, manufacturing, and/or related fields. Students taking Computer-Aided Drafting & Design will receive an introduction to 3-D design using advanced 2-D and 3-D modeling and visualization technologies such as AutoCAD and Inventor. What's more, students will be introduced to the idea of 3-D models that are suitable for 3-D printing and will learn about the different models and drawing specifications that are required by the different manufacturing technologies available today.

**Course Objectives:**

- Students will use AutoCAD to create multi-view (orthographic projection, isometric, section, and detail) drawings.
- Students will use AutoCAD to fully dimension and annotate their drawings.
- Students will use AutoCAD to format their drawings for printing/presentation purposes using sheets, title blocks, and viewports.
- Students will use Autodesk Inventor to create and modify 2-D sketch geometry.
- Students will use Autodesk Inventor to model 3-D parts and build assemblies.
- Students will format and export their Inventor parts and/or assemblies for purposes of 3-D printing.

**Related Standards:**

Pennsylvania Technology and Engineering Standards

*Design Thinking in Technology and Engineering Education:*

- Apply a technology and engineering design thinking process.

*Nature and Characteristics of Technology & Engineering:*

- Demonstrate the use of conceptual, graphical, virtual, mathematical, and physical modeling to identify conflicting considerations before the entire system is developed and to aid in design decision making.

*Design Thinking in Technology and Engineering Education:*

- Apply a broad range of design skills to a design thinking process.
- Analyze and use relevant and appropriate design thinking processes to solve technological and engineering problems.
- Implement the best possible solution to a design using an explicit process.
- Safely apply an appropriate range of making skills to a design thinking process.

#### Units:

1. Using AutoCAD Tools and Commands
2. Creating Multiview Drawings
3. Annotating Your Drawings
4. Creating and Modifying Sketch Geometry
5. Modeling Parts
6. Building Assemblies
7. Formatting and Exporting Parts for Manufacturing

#### Concepts:

- Creating multi-view drawings
- Annotating drawings
- Modeling parts
- Building assemblies
- Communicating your design intent
- Prepping CAD files for various manufacturing processes (i.e. 3-D printing)

#### Competencies:

- AutoCAD drawing tools and commands: OSNAP/OTRACK, Polar/Ortho, Zoom/Pan, Line, Rectangle, Offset, Trim/Extend, Polyline, Spline, Circle, Arc, Ellipse, Fillet/Chamfer, Rotate, Scale, Mirror, Break/Join, Divide/Measure, Array, Stretch/Lengthen
- AutoCAD annotation tools and commands: Text Styles, TEXT/MTEXT, Dimension Styles, Linear, Aligned, Angular, Radius/Diameter, Baseline, Continue
- Inventor sketch tools and commands: Line, Circle, Arc, Rectangle, Fillet, Chamfer, Move, Copy, Rotate, Trim, Extend, Split, Scale, Stretch, Offset, Rectangular Pattern, Circular Pattern, Mirror, Dimension, Constrain
- Inventor modeling tools and commands: Extrude, Revolve, Sweep, Loft, Hole, Fillet, Chamfer, Shell, Rectangular Pattern, Circular Pattern, Mirror, Create Freeform
- 3-D Printing: Native CAD files (.dwg, .blend, .x\_t, .sldprt, .sldasm, .ipt, .iam, .skp), Neutral CAD files (.stl, .amf, .obj, .stp, .step, .3mf, .iges)

#### Learning Activities:

- Instructional video tutorials
- Teacher demonstrations
- Individual classwork

#### Performance Tasks:

- Creating orthographic projection drawings using AutoCAD
- Creating isometric drawings using AutoCAD

<ul style="list-style-type: none"> <li>• Small/large group projects</li> </ul>	<ul style="list-style-type: none"> <li>• Creating section and detail views using AutoCAD</li> <li>• Annotating drawings using AutoCAD</li> <li>• Creating and modifying sketch geometry using Autodesk Inventor</li> <li>• Modeling parts using Autodesk Inventor</li> <li>• Building assemblies using Autodesk Inventor</li> <li>• Creating drawing views using Autodesk Inventor</li> <li>• Annotating drawings using Autodesk Inventor</li> <li>• Communicating your design intent using sheets and presentations</li> <li>• Formatting and exporting CAD files for purposes of 3-D printing/other manufacturing processes</li> </ul>
<b>Other Assessment Measures:</b> <ul style="list-style-type: none"> <li>• Student reflection</li> <li>• Online test/quizzes</li> </ul>	
<b>Textbook/Primary Resource:</b> <ul style="list-style-type: none"> <li>• AutoCAD 2023 Essential Training (LinkedIn Learning/Shawn Bryant)</li> <li>• Autodesk Inventor 2022 Essential Training (LinkedIn Learning/John Helfen)</li> </ul>	
<b>Supplemental Resource Materials:</b> <ul style="list-style-type: none"> <li>• Teacher-generated instructional resources</li> <li>• AutoCAD software</li> <li>• Autodesk Inventor software</li> </ul>	