

Computer Aided Drafting & Design Unit 1: Introduction to 3D Modeling

Unit Focus

This unit introduces the student to concepts and tools for producing solid models that can be efficiently manufactured in an engineering shop. Students will learn and apply the major processes (Sketching, dimensioning, Extrude, Shell, Revolve, Sweep & Loft) within a 3D modeling software (SolidWorks) in creating solutions (models) to a variety of problems. Student will learn these skills/processes in a collaborative fashion with their classmates through conceiving, designing, modeling and creating working prototypes for testing by using 3D printing technologies. The PBA will have students design and 3D print a cell phone stand/audio enhancer.

Stage 1: Desired Results - Key Understandings

Established Goals	Transfer	
<p>Connecticut Goals and Standards <i>Computer Aided Drafting and Design: 12</i></p> <ul style="list-style-type: none"> Apply conventional Computer Aided Drafting and Design processes and procedures accurately, appropriately, and safely. <i>CADD.02.01</i> Describe physical objects as geometric entities.* <i>CADD.02.02</i> Express a design of an object as a 3D model.*(A5) <i>CADD.02.07</i> Identify basic geometric elements (e.g., line, circle, rectangle, sphere, and cube).*(A9) <i>CADD.02.11</i> View file names of a storage device.*(C14) <i>CADD.04.04</i> Store, copy, move, and retrieve information to/from various drives.*(C15) <i>CADD.04.05</i> Rename and backup files*(C16) <i>CADD.04.06</i> Understand the commands and concepts necessary for producing drawings through traditional or computer-aided means. <i>CADD.05.01</i> Use the concepts of geometric construction in the development of design drawings. <i>CADD.05.04</i> Explain the Cartesian Coordinate System.*(E20) <i>CADD.05.07</i> Describe the process for setting and editing drawing elements.*(E21) <i>CADD.05.08</i> Create and edit line types, colors and 	<p>T1 Explore and hone techniques, skills, methods, and processes to create and innovate T2 Develop a product/solution that adheres to key parameters (e.g., cost, timeline, restrictions, available resources and audience).</p>	
	Meaning	
	Understandings	Essential Questions
	<p>U1 Design thinking allows people to trust the process even if it feels nonlinear, to help them improve anything, with anyone, in the world around them. U2 Standardized procedures for creating drawings within a 3D Modeling software package is essential to communicate with various tradesmen in a common language. U3 Fabricating an object requires many steps including planning, drawing and revisions before the object can be manufactured. U4 Modeling, prototyping, and simulation are used in the design and testing of solutions.</p>	<p>Q1 What are the fundamental skills required for the construction of computer based 3D objects? Q2 How do people effectively use the Design Thinking tools in larger teams to identify and solve problems within a community? Q3 How can I communicate my design ideas clearly and efficiently? Q4 Why would you create a prototype of a product before the actual production takes place?</p>
	Acquisition of Knowledge and Skill	
	Knowledge	Skills
<p>K1 Vocabulary: Features, Base, boss, extrusion, axis,</p>	<p>S1 Manipulate relations to create more efficient geometry</p>	

Stage 1: Desired Results - Key Understandings

<p>layers/levels.*(E22) <i>CADD.05.09</i></p> <ul style="list-style-type: none"> • Create and edit basic geometry.*(E23) <i>CADD.05.10</i> • Place and edit text and fonts.*(E24) <i>CADD.05.11</i> • Generate a pictorial drawing.*(E28) <i>CADD.05.15</i> • Scale and print hard copy of an output device.*(E29) <i>CADD.05.16</i> • Create and edit construction planes through reference geometry.*(G35) <i>CADD.06.03</i> • Generate/modify geometric components on construction planes.* <i>CADD.06.04</i> • Create a 3-D model from a 2-D drawing.*(G35) <i>CADD.06.06</i> • Create an assembly in 3-D geometry.*(F31) <i>CADD.07.01</i> • Create an exploded view of a 3-D assembly.*(F32) <i>CADD.07.02</i> <p>Student Growth and Development 21st Century Capacities Matrix</p> <p><i>Creative Thinking</i></p> <ul style="list-style-type: none"> • Imagining: Students will be able to conceive of a novel approach to create a text, performance, solution, application, or inquiry. <i>MM.2.2</i> <p><i>Collaboration/Communication</i></p> <ul style="list-style-type: none"> • Product Creation: Students will be able to effectively use a medium to communicate important information (findings, ideas, feelings, issues, etc.) for a given purpose. <i>MM.3.2</i> 	<p>fillet, chamfer, extrude, sketch, constraints, faces, edges, points, planes, axis, degrees of freedom and assemblies.</p> <p>K2 The major features are: Extrude, Shell, Patterns, Revolve, Sweep, Loft & Mate.</p> <p>K3 3D Modeling has three types of files: part, assembly and drawing.</p> <p>K4 Parametric versus dimensional constraints (relations)</p> <p>K5 Differentiate between Cartesian Coordinate System and the Global Coordinate System.</p> <p>K6 Trimming tools such as Power Trim, Corner, Trim Away Inside, Trim Away Outside and Trim to Closest.</p> <p>K7 Additive prototyping versus subtractive prototyping</p> <p>K8 Part files created in a solid modeling software can be used in a variety of applications/processes ranging from 3D printing, CNC Milling and CNC routing.</p>	<p>when sketching.</p> <p>S2 Create a part using a variety of features.</p> <p>S3 Utilize a 3D printer in creating prototypes in solving problems.</p> <p>S4 Manipulate the criteria within a slicing software to yield to best print results when 3D printing.</p> <p>S5 Combine and apply features to new situations.</p> <p>S6 Assemble several pieces together using the Mate Feature.</p>
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