

# Unit 6 Reverse Engineering

## Unit 6 – Concepts & Objectives

Concepts	Objectives
<p>Material and fastener choices used in a product design should be carefully chosen based on the impact to the product's design, cost, performance, marketability, environmental impact, and expected service life.</p> <p><b>Note: This aligns with the 2012-2013 PREVIEW curriculum.</b></p>	<ul style="list-style-type: none"> <li>Evaluate and compare multiple materials and fastener choices for a product design based on the impact on the design's cost, performance, marketability, environmental impact, and expected service life.</li> </ul> <p><b>Note: This aligns with the 2012-2013 PREVIEW curriculum.</b></p>
<p>Error is unavoidable when measuring a physical property and a measurement is characterized by the precision and accuracy of the measurement.</p>	<ul style="list-style-type: none"> <li>Measure linear distances (including length, inside diameter, and hole depth) with accuracy using a scale, ruler, or dial caliper and report the measurement using an appropriate level of precision.</li> <li>Measure mass with accuracy using a scale and report the measurement using an appropriate level of precision.</li> </ul>
<p>Technical drawings convey information according to an established set of drawing practices which allow for detailed and universal interpretation of the drawing.</p>	<ul style="list-style-type: none"> <li>Determine the minimum number and types of views necessary to fully detail a part.</li> <li>Choose and justify the choice for the best orthographic projection of an object to use as a front view on technical drawings.</li> </ul>
<p>Hand sketching of multiple representations to fully and accurately detail simple objects or parts of objects is a technique used to convey visual and technical information about an object.</p>	<ul style="list-style-type: none"> <li>Hand sketch isometric views of a simple object or part at a given scale using the actual object, a detailed verbal description of the object, a pictorial view of the object, or a set of orthographic projections.</li> <li>Hand sketch orthographic projections at a given scale and in the correct orientation to fully detail an object or part using the actual object, a detailed verbal description of the object, or a pictorial an isometric view of the object.</li> </ul>
<p>Computer aided drafting and design (CAD) software packages facilitate virtual modeling of parts and assemblies and the creation of technical drawings. They are used to efficiently and accurately detail parts and assemblies according to standard engineering practice.</p>	<ul style="list-style-type: none"> <li>Create three-dimensional solid models of parts within CAD from sketches or dimensioned drawings using appropriate geometric and dimensional constraints.</li> <li>Generate CAD multi-view technical drawings, including orthographic projections, sections view(s), detail view(s), auxiliary view(s) and pictorial views, as necessary, showing appropriate scale, appropriate view selection, and correct view orientation to fully describe a part according to standard engineering practice.</li> </ul>
<p>Computer aided drafting and design (CAD) software</p>	<ul style="list-style-type: none"> <li>Assign a specific material (included in the software library) to a part and use the capabilities of the CAD software to determine the</li> </ul>

<p>packages allow virtual testing and analysis of designs using 3D models, assemblies, and animations.</p>	<p>mass, volume, and surface area of an object for which a 3D solid model has been created.</p>
<p>Technical professionals clearly and accurately document and report their work using technical writing practice in multiple forms.</p>	<ul style="list-style-type: none"> <li>• Organize and express thoughts and information in a clear and concise manner.</li> <li>• Adjust voice and writing style to align with audience and purpose.</li> <li>• Utilize an engineering notebook to clearly and accurately document the design process according to accepted standards and protocols to prove the origin and chronology of a design.</li> </ul>
<p>Specific oral communication techniques are used to effectively convey information and communicate with an audience.</p>	<ul style="list-style-type: none"> <li>• Deliver organized oral presentations of work tailored to the audience.</li> </ul>
<p>Sketches, drawings, and images are used to record and convey specific types of information depending upon the audience and the purpose of the communication.</p>	<ul style="list-style-type: none"> <li>• Create drawings or diagrams as representations of objects, ideas, events, or systems.</li> <li>• Select and utilize technology (software and hardware) to create high impact visual aids.</li> </ul>
<p>Visual elements and principles of design are part of an aesthetic vocabulary that is used to describe the visual characteristics of an object, the application of which can affect the visual appeal of the object and its commercial success in the marketplace.</p>	<ul style="list-style-type: none"> <li>• Identify and describe the visual principles and elements of design apparent in a natural or man-made object.</li> <li>• Define aesthetics and explain how the visual elements and principles of design affect the aesthetics and commercial success of a product.</li> </ul>
<p>Reverse engineering involves disassembling and analyzing a product or system in order to understand and document the visual, functional, and/or structural aspects of its design.</p>	<ul style="list-style-type: none"> <li>• Describe the process of reverse engineering.</li> <li>• Justify the use of reverse engineering and explain the various reasons to employ reverse engineering, including discovery, documentation, investigation, and product improvement.</li> <li>• Perform a functional analysis of a product in order to determine the purpose, inputs and outputs, and the operation of a product or system.</li> <li>• Perform a structural analysis of a product in order to determine the materials used and the form of component parts as well as the configuration and interaction of component parts when assembled (if applicable).</li> <li>• Analyze information gathered during reverse engineering to identify shortcoming of the design and/or opportunities for improvement or innovation.</li> </ul>
<p>In order to be an effective team member, one must demonstrate positive team behaviors and act according to accepted norms, contribute to group goals according to assigned roles,</p>	<ul style="list-style-type: none"> <li>• Demonstrate positive team behaviors and contribute to a positive team dynamic.</li> </ul>

and use appropriate conflict resolution strategies.

### **Essential Questions (Unit-Specific)**

1. What considerations should be made in when reverse engineering?
2. What makes a product aesthetically pleasing or eye-catching?
3. How are principles and elements of design used with engineering practice to develop a successful product?

### **Essential Questions (Course-Wide)**

1. How does the design process promote the development of good solutions to technical problems?
2. How can an engineer or technical professional effectively communicate ideas and solutions in a global community?
3. How do inventors and innovators impact and shape society?