



Competency	Performance Indicator	Meets Expectations
Product Development and Design Process	Use brainstorming techniques to generate and document multiple ideas or solution paths to a problem.	I can use brainstorming techniques, adhering to the process for generating and comparing possible design solutions to make a viable and well-justified design.
	Write design brief that demonstrates the product design process including research market need, defining the problem, and clarifying solution criteria.	I can compose a design brief in which the problem is clearly and objectively identified and defined with adequate depth, and it is sometimes elaborated with specific detail, although some information intended as elaboration may be imprecise or general; the justification of the problem highlights the concerns of at least a few primary stakeholders and is based on at least a few sources which are timely and credible; although not all information included may be objective, the justification of the problem offers enough objective detail to allow at least a few measurable design requirements to be determined.
	Use a decision matrix to evaluate and compare multiple design solutions.	I can use a decision matrix to ensure that the choice of design solution was explained and fully supports repetition and testing for effectiveness by others with reference to at least some design requirements.
	Prepare a written and oral presentation of a design solution.	I can accurately and efficiently convey a project plan and solution both orally and in writing.

Hand Sketch	Generate non-technical concept sketches to represent objects or convey design ideas.	<p>I can quickly produce hand sketches using grid or isometric paper that clearly communicate my ideas.</p> <p>I can represent geometric details in proportional sketches. Sketches may need some oral explanation/ clarification to be understood.</p>
	Hand-sketch 1 and 2-point perspective, isometric views, orthographic projections, or scaled full or half section view of an object.	I can produce isometric, oblique and perspective pictorials hand sketches of simple objects and use tonal shading to communicate objects.
	Use CAD (or other) technologies to convert hand sketches to visual aids such as multiview drawings and isometric drawings.	I can formalize sketches using CAD tools including multiview and 3d drawings using accepted engineering conventions.
Annotating and Documenting Models	Read and interpret dimensions and notes on a technical drawing.	I can take a technical drawing and accurately read and interpret the dimensions.
	Dimension orthographic projections and section views of simple objects or parts according to a set of dimensioning standards and accepted practices.	I can dimension the features of an orthographic projection using chain or datum dimensioning (as required) and properly specify on the drawing given size, location, hole notes, and tolerance specifications according to standard dimensioning rules and guidelines. I can properly identify the placement of center and hidden lines as expected.
	Dimension and annotate (including specific and general notes) working drawings according to accepted engineering practice.	I can fully annotate and dimension working drawings to include proper line types, dimensions, material notes, and geometry in a way that makes the drawing buildable.

Computer-Aided Drafting	Create three-dimensional solid models of parts within CAD from sketches or dimensioned drawings using appropriate geometric and dimensional constraints.	I can produce complex parts by using additive and subtractive strategies to create geometry (filleted, angled line sets, polygons) 2D geometries/sketches. I can sketch and add to existing surfaces on a part and/or make appropriate cuts to correctly represent drawn parts.
	Generate CAD multi-view technical drawings, including orthographic projections, section 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.	I can identify the proper position and alignment of the faces of an object represented in both three principal views drawing and pictorial representations of simple objects.
	Apply geometric and numeric constraints to CAD drawings.	I can use appropriate tools within a CAD program environment to constrain a drawing completely and correctly, using both geometric and numeric methods. I can apply this to 2D sketches, 3D parts, and assemblies.
	Create assemblies of parts in CAD and use appropriate assembly constraints to create an assembly that allows correct realistic movement among parts.	I can build assemblies and apply assembly constraints to align parts along flat surfaces and edges and apply concentric and insert components.
Perform Technical Drawing	Create a set of working drawings to detail a design project.	I can create a proficient set of working drawings to detail a project.
	Create notes on a technical drawing that convey information that is specific to part of the drawing and also notes that are general to the entire drawing.	I can use all standard annotation methods effectively to create an easily readable, accurate, and complete document, allowing the knowledgeable reader to create parts and assemblies using only the information provided in the drawing.

<p>Perform Technical Drawing (continued)</p>	<p>Sketch, and explain the difference between general tolerances, limit dimensions, unilateral, and bilateral tolerances.</p>	<p>I can distinguish location and size dimensions and tolerances.</p> <p>I can identify and differentiate among limit dimensions, a unilateral tolerance, and a bilateral tolerance.</p> <p>I can read the specified dimension, tolerance, upper limit, and lower limit for a given dimension and related tolerance.</p>
<p>Document a Project</p>	<p>Utilize project portfolios to present and justify design projects.</p>	<p>I can create a design portfolio that is organized, complete, and accurate according to established protocols and justifies my project.</p>
	<p>Apply engineering notebook standards and protocols to document work.</p>	<p>I can document work using conventional Engineering practices to develop neat, consistent, readable engineering notebook entries. Where appropriate, entries include an annotated sketch or graphic to help explain the design thought process. All entries have page numbers, signatures, and dates.</p>
<p>Computational Analysis and Reasoning</p>	<p>Use advanced spreadsheet functionality to store data, perform calculations, and display data.</p>	<p>I can enter numbers and simple formulas into a spreadsheet and cut, paste, and edit them as needed.</p> <p>I can use built-in spreadsheet tools to represent data on a graph in an spreadsheet.</p>
	<p>Measure and record linear distances, convert linear distance measurements, and apply linear dimensions to a multiview drawing.</p>	<p>I can use calipers, tape measure, rulers, US Customary units, and SI units to accurately and precisely describe measurements of distance and drawing dimensions.</p> <p>I can record linear distances and dimensions in CAD and hand drawn multiview drawings to reflect accurate proportions and measurements.</p> <p>I can convert both US Customary and SI units accurately using dimensional analysis</p>

<p>Computational Analysis and Reasoning (continued)</p>	<p>Use computational techniques (e.g. solve equations, function notation, and slope calculation) to solve engineering problems.</p>	<p>I can evaluate a function (e.g., parametric equation) for an output value when given the corresponding input value.</p> <p>I can determine slope and y- intercept for a linear function representing a set of data when all data points fall on a line.</p> <p>I can determine a function that describes a linear relationship when given a verbal or written description of the relationship or a set of input and output values.</p>
	<p>Calculate statistics pertaining to central tendency and data variation and create simple charts (e.g. dot plots, box plots, histograms) to quantify information, support design decisions, and justify problem solutions.</p>	<p>I can calculate a mean, median, mode, and standard deviation for a set of data and graphically represent it using a histogram or dot plot to show form of distribution. I can identify graphical characteristics of a normal distribution and categorize a set of data based on a histogram or dot plot.</p>