




Legend:

X The standard is clearly addressed by program activities.

- This standard potentially could be addressed as part the program either by actions that the coach or teacher takes when working with the students or by conditions established by the program.

		Introduction to Engineering Design DOE Code: 4802 Recommended Grade Level: 9 Recommended Prerequisites: None			
Domain 0		Project Management			
Core Standard 1	Students will exhibit appropriate safety practices while working with tools and equipment.				
	IED – 0.1.1	Demonstrate relevant safety practices when using tools and equipment as determined by task, materials, environment, and protective attire.	X	X	X
	IED – 0.1.2	Apply corrective action(s) to eliminate hazards.	X	X	X
Core Standard 2	Students will investigate various careers within the fields of engineering and technology				
	IED – 0.2.1	Identify engineering and technology occupations and the roles and responsibilities of each.	X	X	X
	IED – 0.2.2	Report job outlook, demand, and projected wages for engineering and technology careers.	-	-	-
	IED – 0.2.3	Explore job opportunities that are available in engineering and technology.	X	X	X
	IED – 0.2.4	Investigate post-secondary training opportunities and industry certifications that are available.	X	X	X
Core Standard 3	Students will communicate the design process				
	IED - 0.3.1	Explain the importance of documentation.	X	X	-
	IED - 0.3.2	Apply sketching and annotation skills to document work.	X	X	-
	IED - 0.3.3	Produce working drawings using appropriate drawing styles and techniques.	X	X	-
	IED - 0.3.4	Document project components into an engineering notebook (digital or paper).	X	X	-
	IED - 0.3.5	Communicate technical knowledge in a variety of formats	X	X	X
	IED - 0.3.6	Create a presentation that outlines team or individual priorities for design and share with peers.	X	X	X

Core Standard 4	Students will apply appropriate research techniques				
	IED - 0.4.1	Formulate unbiased research questions to collect information/data.	X	X	X
	IED - 0.4.2	Apply appropriate investigative strategies.	X	X	X
	IED - 0.4.3	Evaluate sources appropriate for academic research.	-	-	-
	IED - 0.4.4	Select resources relevant to the identified problem	X	X	X
	IED - 0.4.5	Synthesize information collected during the research process	X	X	X
	IED - 0.4.6	Generate a list of sources used to gather information using APA or MLA format.	-	-	-
Domain 1	Design Process				
Core Standard 5	Students perform the steps of the design process to develop and analyze products and systems.				
	IED – 1.5.1	Describe the steps in the design process.	X	X	-
	IED – 1.5.2	Generate a valid and justifiable problem.	X	X	-
	IED – 1.5.3	Create a design brief by constructing a problem and design statement and identifying problem constraints.	X	X	X
	IED – 1.5.4	Apply the steps of the design process as they are used to solve the problem.	X	X	X
	IED – 1.5.5	Describe the iterative nature of the design loop.	X	X	X
	IED – 1.5.6	Discuss how the design process impacts the outcome when designing solutions to problems.	X	X	X
	IED – 1.5.7	Assess and refine original design solutions based upon reflection, critique, practice, and research.	X	X	X
Domain 2	Technical Drawing Standards				
Core Standard 6	Students will produce industry standard sketches and drawings to allow for universal communication.				
	IED – 2.6.1	Distinguish between line types utilized on a technical drawing per industry standard (ANSI Line Conventions and Lettering Y14.2M-2008).	-	-	-
	IED – 2.6.2	Interpret and develop appropriate annotations for technical drawings.	-	-	-
	IED – 2.6.3	Differentiate between the various types of tolerances.	-	-	X
	IED – 2.6.4	Analyze types of fits in relation to mating parts.	X	X	X
	IED – 2.6.5	Collect and display data related to the sizes and shapes of objects utilizing various measuring tools.	X	X	X
	IED – 2.6.6	Determine the appropriate number of views, including alternate views (auxiliary, section, detail), to fully document the details of a design.	-	-	-

	IED – 2.6.7	Identify and produce various pictorial drawings including isometric, oblique, and perspective drawings for technical drawing representations.	-	-	-
	IED – 2.6.8	Differentiate when the physical properties of geometric shapes can be utilized in order to optimize design solutions.	-	-	-
	IED – 2.6.9	Apply industry accepted dimensioning practices to technical drawings in order to annotate design features.	-	-	-
	IED – 2.6.10	Identify and produce multiview drawings in proper orientation, scale, and proportion through methods of orthographic projection.	-	-	-
	IED – 2.6.11	Illustrate and calculate mathematical problems related to real world situations involving characteristics of geometric shapes and solids.	-	-	-
Domain 3	Reverse Engineering				
	Students will perform various analyses of systems or products with the purpose of developing appropriate improvements.				
Core Standard 7	IED – 3.7.1	Identify visual, functional and structural properties of a product.	x	x	x
	IED – 3.7.2	Differentiate between invention and innovation.	x	x	x
	IED – 3.7.3	Describe the relationship between reverse engineering and product/system improvement.	x	x	x
	IED – 3.7.4	Create an innovation to a system or product using information obtained from a product analysis.	x	x	x
	IED – 3.7.5	Evaluate the effectiveness of elements and principles in other design solutions and use analysis to revise original design.	x	x	x
	IED – 3.7.6	Perform mathematical calculations to identify structural properties of a product.	x	x	x
Domain 4	Project Documentation				
	Explain the role of intellectual property in design and the necessity of producing and keeping an engineering notebook.				
Core Standard 8	IED – 4.8.1	Maintain a working engineering notebook for the duration of the course.	x	x	-
	IED – 4.8.2	Implement design briefs in the problem solving process.	x	x	-
	IED – 4.8.3	Collaborate on engineering projects by working in design teams to solve valid problems.	x	x	-
	IED – 4.8.4	Manage time and the progress of a project through effective use of a Gantt chart.	-	-	-

Domain 5		Engineering Design			
Core Standard 9	Students assess the components and ethics of engineering design to understand their role in the design process.				
	IED – 5.9.1	Discuss historical and current events related to engineering and technology and analyze the impact on society.	-	-	-
	IED – 5.9.2	Discuss the importance of ethics in engineering design.	X	X	X
	IED – 5.9.3	Apply the design principles and elements.	X	X	X
	IED – 5.9.4	Use engineering design equipment (3D modeling software, 3D printer, etc.) to create 3D and 2D models to document engineering design.	X	X	X
	IED – 5.9.5	Identify the qualities of engineering design and their relationship to a design matrix.	X	X	X
	IED – 5.9.6	Examine a design (product) with respect to its quality and usability.	X	X	X
	IED – 5.9.7	Use the design principles and elements to meet the design criteria and constraints to solve a valid problem.	X	X	X
Domain 6		Modeling			
Core Standard 10	Students create designs using a variety of modeling techniques to communicate information.				
	IED – 6.10.1	Formulate methods of communicating designs using various forms of modeling such as conceptual, graphical, mathematical, physical or computer modeling.	X	X	X
	IED – 6.10.2	Utilize appropriate modeling materials to construct a physical model such as a prototype or mock-up.	X	X	X
	IED – 6.10.3	Interpret the details of a sketch and generate physical or computer models using appropriate modeling materials and techniques.	X	X	X
	IED – 6.10.4	Recognize and utilize constraints such as dimensional, geometric, assembly and parametric constraints in regard to modeling.	X	X	X
	IED – 6.10.5	Identify the six degrees of freedom of a component floating in space in the context of an assembly.	-	-	-
	IED – 6.10.6	Differentiate between assemblies and subassemblies and their appropriate use.	X	X	X
	IED – 6.10.7	Analyze the remaining degrees of freedom of mating components after systematically applying assembly constraints until only desired components are allowed to move.	-	-	-
Domain 7		Aesthetics			
Core Standard 11	Students demonstrate artistic fundamentals which are utilized throughout the engineering design process to solve visual problems and communicate ideas for a product or system.				
	IED – 7.11.1	Apply visual design principles to enhance the aesthetic appeal of a design solution.	X	-	-
	IED – 7.11.2	Analyze products or systems by identifying problematic features to generate potential solution(s).	X	X	X

	IED – 7.11.3	Choose appropriate symbols and metaphors from art and design and describe their origin, function, and value in the solutions.	x	x	x
	IED – 7.11.4	Create multiple solutions that demonstrate and distinguish mastery in producing effective relationships between elements, media, and function.	x	x	x
	IED – 7.11.5	Create design solutions that use specific elements, principles, and functions that demonstrate skill and understanding of different communication processes to solve problems.	x	x	x