

# **DESIGN APPLICATIONS IN ENGINEERING AND TECHNOLOGY EDUCATION I**

## Curriculum Content Frameworks

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# Curriculum Content Frameworks

## DESIGN APPLICATIONS I

Grade Levels: 8-9

Prerequisites: Introduction and Fundamentals of Engineering and Technology Education

Course Code:

Course Description: This 18 week course is designed to provide 8th and 9th grade students with a more in-depth look at the application of engineering and technology in the fields of construction and information technology. Students will also further their understanding of technology and the use of the engineering design loop to solve technological problems. Emphasis will be placed on the further exploration and application of engineering and technology through experiments and design projects.

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# Unit 1: Design Applications of Construction Technologies

## Hours: 45

Terminology: arch, dome, design principles, design elements, form, line, stud, sole plate, top plate, cripple stud, fascia, rafter, joist

<b>CAREER and TECHNICAL SKILLS</b> What the Student Should be Able to Do		<b>ACADEMIC and WORKPLACE SKILLS</b> What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
1.1 Understand how the engineering design process is used in construction technology	1.1.1 Students will be presented with a real world construction technology problem and will use the engineering design process to research potential solutions	Foundation	Listening	Comprehends ideas and concepts related to the engineering design process and construction technology [1.2.1]
	1.1.2 Participate in discussions about the types of drawings required for residential and commercial construction	Thinking Skills	Writing Reasoning	Communicates thoughts, ideas, or facts in written form in a clear, concise manner [1.6.6] Comprehends ideas and concepts related to construction [4.5.2]
1.2 Identify the appropriate measurement device for the application	1.2.1 Connect the principles of measurement to real world applications	Foundation	Listening	Comprehends ideas and concepts related to the planning process in construction [1.2.1]
	1.2.2 Estimate the amount of material needed for a given project	Thinking Skills	Reasoning	Comprehends ideas and concepts related to the planning process in construction [4.5.2]
	1.2.3 Calculate quantity of materials needed in nominal and standard material sizes			
1.3 Identify common construction tools and materials as well as appropriate techniques and applications	1.3.1 Accurately cut materials to correct dimensions.	Foundation	Math Science	Draws to scale [1.1.20] Determines quantities/measurements in English and metric units [1.4.14]
	1.3.2 Assemble wall section using appropriate techniques, fasteners, and procedures.	Thinking	Seeing Things in the Mind's Eye	Visualizes a finished product [4.6.4] Applies rules and principles to a new situation [4.5.1]
	1.3.3 Assemble small-scale structure that includes a window and door			
1.4 Recognize the importance of building codes and standards in construction	1.4.1 Participate in a discussion of the importance of city codes and covenants	Foundation	Math Science	Draws to scale [1.1.20] Reads measurements from common measuring devices [1.4.20]
	1.4.2 Apply to building codes and standards to small-scale construction project	Thinking Skills	Creative Thinking	Constructs model to depict basic concept of construction[1.4.11] Creates new design by applying specified criteria [4.1.3]

<b>CAREER and TECHNICAL SKILLS</b> What the Student Should be Able to Do		<b>ACADEMIC and WORKPLACE SKILLS</b> What the Instruction Should Reinforce		
<b>Knowledge</b>	<b>Application</b>	<b>Skill Group</b>	<b>Skill</b>	<b>Description</b>
1.5 Identify, design, and construct a structure to serve a need in the community	1.5.1 Identify a need for a structure within the community  1.5.2 Design and implement a construction project	Foundation    Thinking Skills	Math Science   Creative Thinking	Draws to scale [1.1.20] Reads measurements from common measuring devices [1.4.20] Constructs model to depict basic concept of construction[1.4.11] Creates new design by applying specified criteria [4.1.3]

## Unit 2: Design Applications of Information and Communication Technologies

**Hours: 45**

Terminology: typography, font, social media, raster, vector, storyboarding, corporate identity, trademark, logo

<b>CAREER and TECHNICAL SKILLS</b> What the Student Should be Able to Do		<b>ACADEMIC and WORKPLACE SKILLS</b> What the Instruction Should Reinforce			
Knowledge	Application	Skill Group	Skill	Description	
2.1 Understand the impact, significance, and role that information and communication systems play in our daily lives	2.1.1 Participate in discussions, readings, and presentations that explore the control and influence that information and communication systems have on a given audience	Foundation	Listening	Comprehends ideas and concepts related to information and communication systems [1.2.1]	
		Thinking Skills	Reasoning	Comprehends ideas and concepts related to information and communication system [4.5.2]	
2.2 Recognize the format and purpose of information and communication systems	2.2.1 Identify and categorize specific examples of media formats	Foundation	Listening	Comprehends ideas and concepts related to media formats used in information and communication systems [1.2.1]	
	2.2.2 Compare and contrast the structure, intended audience, and purpose for using a specific media format	Thinking Skills	Math	Comprehends a mathematical ideas and concepts related to multi-media formats used in information and communication systems [1.1.13]	
	2.2.3 Collect and classify examples of print, audio, video, and web media formats		Reasoning	Comprehends ideas and concepts related to the use of information and communication systems used to convey a specific purpose [4.5.2]	
2.3 Identify and explore the elements and principles of design in various applications and types of media	2.3.1 Experiment with line, shape, color, and texture to familiarize themselves with the elements of design	Foundation	Math	Constructs geometric figures [1.1.15] Uses basic geometric symbols, terms, principles, and formulas [1.1.34]	
	2.3.2 Create a 3D model that incorporates the elements and principles of design	Thinking Skills	Writing	Communicates thoughts, ideas, or facts in written form in a clear, concise manner [1.6.6] Uses language, style, organization, and format appropriate to subject matter, purpose, and audience [1.6.1]	
	2.3.3 Participate in discussions regarding printing and the various methods of digital publishing		Seeing Things in the Mind's Eye	Visualizes a finished product [4.6.4]	
2.4 Recognize the elements of a corporate identity package	2.4.1 Assess the effectiveness of a corporate identify package	Foundation	Writing	Communicates thoughts, ideas, or facts in written form in a clear, concise manner [1.6.6]	
	2.4.2 Design a corporate identity package for a school event	Thinking Skills	Reasoning	Uses logic to draw conclusions from available	

<b>CAREER and TECHNICAL SKILLS</b> What the Student Should be Able to Do		<b>ACADEMIC and WORKPLACE SKILLS</b> What the Instruction Should Reinforce		
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	2.4.3 Draft a trademark application complete with products			information [4.5.6]
2.5 Compose and assess a design portfolio	2.5.1 Create a design portfolio that may include: a logo, trademark application, t-shirt, poster, public service announcement (PSA), web based advertisement, brochure, etc.	Foundation	Writing	Organizes information into an appropriate format [1.6.10]
	2.5.2 Create an assessment tool to analyze the effectiveness of the design portfolio	Thinking Skills	Speaking	Communicates a thought, idea, or fact in spoken form [1.5.5]
	2.5.3 Present a design portfolio to the class		Creative Thinking	Combines ideas or information in a new way [4.1.2]

## Unit 3: Design Applications: Safety

### Hours: As needed

Terminology: Safety procedure, OSHA, ergonomics, first aid, hazard avoidance, protective clothing, personal protection equipment, accident prevention, safety tests, materials safety

<b>CAREER and TECHNICAL SKILLS</b> What the Student Should be Able to Do		<b>ACADEMIC and WORKPLACE SKILLS</b> What the Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
3.1 Describe the need for safe work environments in the Engineering and Technology Educational classroom and laboratory	3.1.1 Maintain personal safety, workplace safety, hazard avoidance, safety information systems, protective clothing, fall protection, first aid, ergonomics, and environmental safety	Thinking        Personal Management	Seeing Things in the Mind's Eye	Imagines the flow of work activities from narrative descriptions [4.6.1]
	3.1.2 Explore implemented safety procedures and discuss classroom and laboratory safety		Knowing how to Learn	Applies new knowledge and skills to safety [4.3.1]
			Creative Thinking	Makes connections between seemingly unrelated ideas [4.1.6]
			Responsibility	Pays close attention to details [3.4.8]
3.2 Describe specific procedures such as reporting illness, injuries, safety violations, etc.	3.2.1 Demonstrate understanding of specific work procedures such as reporting illness, injuries, safety violations, etc.	Foundation	Listening	Listens and follows directions [1.2.6]
3.3 Use appropriate and required personal protection equipment (eye protection, ear protection, etc.)	3.3.1 Practice using appropriate and required personal protection equipment (eye protection, ear protection, etc.)	Thinking	Problem Solving	Devises and implements a plan of action to resolve a problem [4.4.3]
3.4 Describe machine and tool safety practices and procedures	3.4.1 Demonstrate the ability to safely use common tools and machines found in given industrial settings	Thinking Skills	Decision Making	Demonstrates decision-making skills [4.2.4]
	3.4.2 Demonstrate the ability to pass given safety tests that show evidence of personal safety competence on given tools and machinery	Foundation Skills	Reading	Comprehends written specifications and applies them to a task [1.3.9]  Reads and follows instructions to operate technical equipment [1.3.19]
	3.4.3 Participate in a discussion concerning securing machinery, securing guards and safety devices, slipping hazards, eye and ear protection, adequate space around machinery, machine vibration, hand feeding and retrieval tools, power transmission parts, blade and cutter safety, worker position safety, safe		Science	Follows safety guidelines [1.4.15]
		Speaking	Participates in conversation, discussion, and group presentations [1.5.8]	

<b>CAREER and TECHNICAL SKILLS</b> What the Student Should be Able to Do		<b>ACADEMIC and WORKPLACE SKILLS</b> What the Instruction Should Reinforce		
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	<p>procedures for adjusting or repairing machinery, shear points, falling objects, flying objects, rotating parts, moving surfaces, etc.</p> <p>3.4.4 Design and post a set of rules for machine safety, personal safety, hazard safety issues, rules for horseplay, materials safety, combustible materials, etc</p> <p>3.4.5 Operate tools and equipment in a safe and hazard free manner to the satisfaction of the course instructor</p>	Thinking Skills	Problem Solving	Comprehends ideas and concepts related to machine and tool safety [4.4.1]

## Glossary

### Unit 1: Design Applications of Construction Technologies

1. Arch: An arch is a structure that spans a space and supports a load using an arc shape which eliminates tensile stresses in spanning a great amount of open space.
2. Dome: a structural element of architecture that resembles the hollow upper half of a sphere.
3. Design principles: fundamental ideas about the practice of good design in all visual design fields including graphic design, industrial design, architecture, and art. The principles of design describe how the elements of design come together to create a design.
4. Design elements: the basic units of a visual piece that make up a design including line, color, shape, texture, space, and form
5. Stud: a vertical structural member in a building's wall.
6. Sole plate: the bottom horizontal member of a wall or building to which vertical members are attached.
7. Top plate: the top horizontal member of a wall or building to which vertical members are attached. A second layer of dimensional lumber, called a double top plate is often fastened to the top plates of the erected walls so that no joints overlap, providing greatly increased stability.
8. Cripple stud: shorter studs that span the area from the bottom plate to the sill and sometimes from the top of the window to a header, or from a header to a top plate.
9. Fascia: a term used in architecture to refer to a band running horizontally and situated vertically under the roof edge or which forms the outer surface.
10. Rafter: structural members that support the roof of a building
11. Joist: horizontal supporting members that run from wall to wall, wall to beam, or beam to beam to support a ceiling, roof, or floor.

## Unit 2: Design Applications of Information and Communication Technologies

1. Typography: the art and technique of arranging type in order to make language visible.
2. Font: a set of type of a particular face and size.
3. Social media: web-based and mobile-based technologies which are used to turn communication into interactive dialogue among organizations, communities, and individuals. Social media is often referred to as center of the Web 2.0 movement, which allows users to create and exchange user-generated content. Examples of social media include blogs, wikis, podcasts, online photo sharing, and social bookmarking.
4. Raster: resolution dependent graphics that cannot be scaled up to an an arbitrary resolution without the apparent loss of quality.
5. Vector: graphics that are based on geometrical intenties such as points lines, curves, shapes or polygons. Vector graphics are based on paths or strokes that can be scaled through control points without the apparent loss of quality.
6. Storyboarding: a type of graphic organizer in the form of illustration and/or images displayed sequentially for the purpose of pre-visualizing a motion picture, animation, motion graphic, or interactive media sequence.
7. Corporate identity: the 'persona' of a corporation that is designed to accord with and facilitate the attainment of business objectives. It is typically visibly manifested by way of branding and the use of logos and trademarks.
8. Trademark: a distinctive sign or indicator used by an individual, business organization, or other legal entity to identify for consumers that the products or services on or with which the trademark appears originate from a unique source, designated for a specific market, and to distinguish its products or services from those of other entities.
9. Logo: a graphic mark or emblem commonly used by commercial enterprises, organizations, and individuals to aid and promote instant public recognition. Logos are either purely graphic (symbols/icons) or are composed of the name of the organization (a logotype or wordmark).

## Unit 3: Safety

1. Safety procedures: Proper usage techniques for a given piece of equipment or tool
2. OSHA: Occupational Safety and Health Administration. A division of the Department of Labor that sets and enforces occupational health and safety rules
3. Ergonomics: The applied science of equipment design, as for the workplace, intended to maximize productivity by reducing operator fatigue and discomfort
4. First Aid: Emergency aid or treatment given to someone injured, suddenly ill, etc., before regular medical services arrive or can be reached
5. Hazard Avoidance: Systems designed to plan ahead and prevent dangerous workplace situation before they occur
6. Protective Clothing: Clothing aimed at protecting the skin from various health hazards that may be encountered in the workplace
7. Personal Protection Equipment: Includes equipment like safety glasses, gloves, hearing protection, etc. designed to protect the worker in hazardous areas
8. Accident Prevention: The practice of developing practices and habits that prevent accidents before they occur
9. Safety Test: A test designed to prove that a student has the appropriate skills and knowledge to safely operate a given tool or machine
10. Materials Safety: The act of using materials and resources in a safe and environmentally friendly manner