Course Title	Content Area	Grade Level:	Credit (if applicable)
Tools and Materials	CTE	9-12	0.5 Credit

Course Description

This laboratory-based exploratory course introduces students to a variety of materials and to the tools and machines used to process them. Materials utilized may include woods, metals, and plastics. A variety of manufacturing processes will be surveyed, including separating, forming, combining, joining, conditioning, and finishing. The hands-on instructional aspects of this course focus on proper operating procedures and safe operation of tools and machines.

Aligned Core Resources	Connection to the ***BPS Vision of the Graduate***
CCTC Standards (CTE)	CONTENT MASTERY • Develop and draw from a baseline understanding of knowledge in academic disciplines from our Bristol curriculum. CRITICAL THINKING AND PROBLEM SOLVING • Collect, assess and analyze relevant information • Reason effectively. Use systems thinking. • Make sound judgments and decisions. Identify, define and solve authentic problems and essential questions. • Reflect critically on learning experience, processes and solutions. • Transfer knowledge to other situations.
Additional Course Information: ***Knowledge/Skill Dependent courses/prerequisites***	**Link to *Completed Equity Audit***
None	Tools & Materials - Equity Curriculum Review (2025)

Standard Matrix

Standard	Unit 1	Unit 2	Unit 3	Unit 4
CCTC - AC - Use vocabulary, symbols and formulas common to architecture and construction.	X			
CCTC - AC-CST - Compare and contrast the building systems and components required for a construction project.		X		X
CCTC - AC - Comply with regulations and applicable codes to establish and manage a legal and safe workplace.			X	X
CCTC - AC -Use architecture and construction skills to create and manage a project				X

Unit Links

Unit 1: Measurements
Unit 2: Materials
Unit 3: Safety
Unit 4: Tools and Material Processing

Unit Title	
Unit 1: Measurements	
Relevant Standards: Bold indicates priority	
CCTC - AC 1 - Use vocabulary, symbols and formulas common to architecture and construction.	
Essential Question(s)	**Enduring Understanding(s)**
Can you measure to the nearest 1/16 of an inch?	Learning how to measure properly is a skill that is beneficial in everyday life.
Demonstration of Learning	**Pacing for Unit**
• Written documents • Formative and Summative Assessment	3 Days
Family Overview (link below)	**Integration of Technology**
Tools & Materials - Family Overview (2025)	N/A
Unit-specific Vocabulary	**Aligned Unit Materials, Resources, and Technology (beyond core resources)**
Ruler, Tape Measure, 1/16th's, Inches, feet, millimeter, centimeter, meter.	N/A
Opportunities for Interdisciplinary Connections	**Anticipated misconceptions**
Students will use and reinforce what they learned in math classes regarding the relationship between fractions and decimals, addition and subtraction of fractions.	Students may struggle with reading a ruler and understanding what each mark means on a ruler.
Connections to Prior Units	**Connections to Future Units**
N/A	Students will be using measurements throughout the course on various projects.
Differentiation through *Universal Design for Learning*	
UDL Indicator and Teacher Actions	
Representation • Use color-coded rulers with labeled increments for better differentiation of whole inches, half-inch, quarter-inch, etc. • Provide diagram posters showing measurement breakdowns. • Offer fraction equivalency charts with visuals to support simplification (e.g., showing 8/16 and 1/2 as equal). • Use demonstration videos or AR/VR tools to show real-world applications. • Provide digital measurement tools (e.g., virtual rulers, online fraction games). • Offer verbal explanations alongside written instructions. Action & Expression • Allow students to physically manipulate rulers and tape measures to explore increments. • Use tangible fraction tiles or folded paper strips to show measurement divisions. • Provide sentence starters for explanations (e.g., "This mark is __ inches because…"). • Use peer teaching where students explain a measurement process to a partner. Engagement • Connect measurements to real woodworking projects (e.g., building a small shelf). • Allow students to choose a woodworking project that involves applying measurements. • Use examples from students' backgrounds (e.g., measuring in different construction styles or traditional woodworking). • Encourage students to compare measurement systems (e.g., metric vs. imperial).	
Supporting Multilingual/English Learners	
Related *CELP standards:*	**Learning Targets**

CELP Level	LT 1	LT 2
Emerging	• Recognizes and points to ruler markings with visual or gesture-based support. • Names basic increments with a word bank or	• Recognizes visual fraction models • Identifies equivalent fractions with the support of charts or manipulatives.

	bilingual glossary. • Uses sentence starters to explain markings • Copies measurements with modeling from the teacher or a peer. • Uses pre-marked templates or traces existing measurements. • Describes measurement placement using basic phrases	• Answers yes/no questions about simplification • Matches fractions to simplified forms using visual aids. • Reduces fractions by recognizing common patterns • Uses sentence frames
Expanding	• Names all ruler increments and describes spacing patterns • Explains where a measurement is found using simple sentences. • Uses comparisons • Accurately marks measured points and explains steps for transferring measurements. • Uses sequencing words to describe the process • Asks for clarification when needed using content-specific language	• Uses step-by-step reasoning to determine if a fraction can be simplified. • Explains simplification using basic mathematical language • Identifies real-world examples of fraction simplification • Independently reduces fractions and explains how • Applies simplification when reading or writing measurements. • Uses complete sentences with some academic vocabulary
Bridging	• Explains precisely how ruler increments relate to each other. • Uses technical vocabulary to describe measurements • Justifies answers using mathematical reasoning • Explains why certain measuring techniques improve accuracy. • Uses self-correction strategies • Writes or speaks using detailed multi-step instructions for measuring and cutting wood.	• Uses formal mathematical reasoning • Justifies simplification choices with evidence • Applies fraction simplification automatically while working with measurements. • Explains the impact of simplification in practical contexts • Teaches peers how to simplify fractions using academic and technical vocabulary.

Lesson Sequence	**Learning Target**	**Success Criteria/Assessment**
1	I can accurately measure to the nearest 1/16th of an inch.	• I can identify and explain the markings on a standard ruler or tape measure, including whole inches, half-inch, quarter-inch, eighth-inch, and sixteenth-inch increments. • I can transfer accurate measurements onto wood for cutting, drilling, or assembling.
2	I can accurately reduce fractions as necessary.	• I can identify when a fraction can be simplified. • I can simplify fractions in woodworking measurements (e.g., reducing 8/16 to 1/2 inch).

Unit Title	
Unit 2: Materials	
Relevant Standards: Bold indicates priority	
CCTC - AC-CST - Compare and contrast the building systems and components required for a construction project.	
Essential Question(s)	**Enduring Understanding(s)**
How can selecting the proper material lead to a product which can meet strength, durability, cost and aesthetics constraints?	• Material selection involves balancing properties, cost, availability, and environmental impact. • Wood properties and applications are determined by its deciduous or coniferous origin. • Ferrous and non-ferrous metals differ significantly in magnetic properties, corrosion resistance, and uses. • The diverse structures and properties of thermoplastics, thermosets, and elastomers dictate their wide range of polymer applications. • Composites combine materials to achieve enhanced properties beyond those of individual components.
Demonstration of Learning	**Pacing for Unit**
• Formative and summative assessments • Project design demonstrating why they chose the best material	7 Days
Family Overview (link below)	**Integration of Technology**
Tools & Materials - Family Overview (2025)	N/A
Unit-specific Vocabulary	**Aligned Unit Materials, Resources, and Technology (beyond core resources)**
Ferrous, non-ferrous, composite, coniferous, deciduous, malleable, ductility, insulator, conductor, engineered lumber	N/A
Opportunities for Interdisciplinary Connections	**Anticipated misconceptions**
Students will use and reinforce what they may have learned in science classes such as chemistry and biology regarding the lifecycle of a material.	• All woods are the same and have no direct impact on the impact of a project • The cost of a material is the only thing that should be considered when choosing the best material for a project. • Plastic, fiberglass, carbon fiber and kevlar are all the same basic thing.
Connections to Prior Units	**Connections to Future Units**
How wood is sold related to how a particular size is determined	Material selection based upon project constraints
Differentiation through *Universal Design for Learning*	
UDL Indicator and Teacher Actions	
Representation • Provide diverse resources, such as diagrams, videos, or hands-on demonstrations of material properties, to cater to different learning styles. Action and Expression • Facilitate student exploration by providing opportunities to test materials, such as strength tests or cost evaluations, and allow them to reflect on their choices. Engagement • Use case studies of successful product designs or failures to spark discussion about the importance of selecting the right material. Encourage students to share their opinions on how different materials affect their own daily experiences.	
Supporting Multilingual/English Learners	

Related CELP standards:	Learning Targets					
CELP Level	**LT 1**	**LT 2**	**LT 3**	**LT 4**	**LT 5**	**LT 6**
Emerging	Identifies *one* basic factor influencing material choice (e.g., "It needs to be strong" or "It shouldn't cost too much") and gives a simple example.	Names at least *two* broad categories of wood (e.g., hardwood and softwood) and gives one example of each.	Names at least *one* type of engineered lumber (e.g., plywood) and states *one* thing it's used for.	Recognizes common nominal lumber dimensions (e.g., 2x4) and relates them to the idea of standard sizing.	Names at least *two* common types of metal (e.g., steel, aluminum) and states *one* general use for each.	Names at least *two* common types of plastic (e.g., water bottle plastic, grocery bag plastic) and states *one* common use for each.
Expanding	Identifies *multiple* factors contributing to material selection (e.g., strength, cost, weight, appearance) and provides basic explanations of their importance for different general applications.	Describes *several* classifications of wood (e.g., hardwood vs. softwood, domestic vs. imported, coniferous vs. deciduous) and provides examples for each, explaining a basic difference between the categories.	Describes the basic characteristics (e.g., made of layers, strong) and identifies *multiple* uses and benefits of *several* types of engineered lumber (e.g., plywood, OSB, MDF).	Explains the difference between nominal and actual lumber dimensions and describes how standard sizing impacts purchasing and construction, possibly identifying common thicknesses and widths for different lumber types.	Describes basic characteristics (e.g., strength, conductivity, malleability) and identifies *multiple* uses and benefits of *several* common metals (e.g., steel, aluminum, copper, brass).	Describes basic characteristics (e.g., flexibility, durability, transparency) and identifies *multiple* uses and benefits of *several* types of plastics (e.g., PET, HDPE, PVC), possibly distinguishing between thermoplastics and thermosets in a basic way.
Bridging	Explains *how* several interacting factors influence material selection for a *specific* application, justifying reasoning with details about material properties and the demands of the application, perhaps considering trade-offs.	Explains the *basis* for different wood classifications (e.g., botanical origin, density, grain structure) and discusses how these classifications relate to the properties and typical uses of different types of wood.	Explains *how* the manufacturing process of different engineered lumber products results in specific characteristics and benefits, and analyzes why a particular type of engineered lumber might be chosen over solid lumber for a given application.	Explains the reasons behind nominal sizing conventions, discusses how these standards facilitate trade and construction, and perhaps understands how moisture content affects final dimensions.	Explains *how* the atomic structure and alloying processes of different metals result in specific characteristics and benefits, and analyzes why a particular metal might be chosen for a specific engineering application.	Explains *how* the chemical structure and processing of different types of plastics result in specific characteristics and benefits, and analyzes the trade-offs between different plastics for a particular application, perhaps considering environmental impacts.

Lesson Sequence	Learning Target	Success Criteria/Assessment
1	I can explain what factors contribute to a material being selected for an application.	• I can give three reasons why a material is selected for an intended application
2	I can explain the different classifications of wood materials.	• I can name the two classifications of wood • I can name three species for each classification above
3	I can describe the characteristics of engineered lumber and know its uses and benefits.	• I can give four examples of an engineered lumber • I can name three the benefits of engineered wood products

4	I can explain how wood products are sized for commerce.	• I can explain the difference between a board foot, dimensional and nominally sized lumber as well as wood sold by the linear foot
5	I can describe the characteristics of metal materials and know its uses and benefits.	• I can name the two classifications of metals • I can explain the difference between ferrous and non-ferrous metal • I can name three types for each classification above
6	I can describe the characteristics of different types of plastics and know their uses and benefits.	• I can name the two classifications of a polymer • I can name three different composites. • I can name two characteristics for the composite above

Unit Title	
Unit 3: Safety	
Relevant Standards: Bold indicates priority	
CCTC - AC - Comply with regulations and applicable codes to establish and manage a legal and safe workplace.	
Essential Question(s)	**Enduring Understanding(s)**
How is incorporating safety important inside and outside the laboratory?	• Safety is a top priority in whatever you do. • Tool and machine safety keeps every
Demonstration of Learning	**Pacing for Unit**
• Formative and summative assessments	5 Days
Family Overview (link below)	**Integration of Technology**
Tools & Materials - Family Overview (2025)	N/A
Unit-specific Vocabulary	**Aligned Unit Materials, Resources, and Technology (beyond core resources)**
OSHA, SDS/MSDS, PPE, Z87	N/A
Opportunities for Interdisciplinary Connections	**Anticipated misconceptions**
Safety knowledge can be important for other lab based courses such as Science.	• Eyewear is not important • Injuries will not happen to me
Connections to Prior Units	**Connections to Future Units**
N/A	Use of selected materials for project creation with tools

Differentiation through *Universal Design for Learning*

UDL Indicator and Teacher Actions

Representation

- Present safety procedures and guidelines in multiple formats (e.g., verbal instructions, visual safety posters, demonstrations, interactive videos) to ensure all students can understand the safety protocols effectively.
- Display clear safety posters around the classroom and lab that explain safety rules and emergency procedures.
- Verbally walk students through safety procedures, providing step-by-step instructions on handling tools, equipment, and materials.
- Show students how to use equipment safely and demonstrate proper safety gear usage.
- Use online safety quizzes or interactive simulations to test students' understanding of safety rules before engaging in lab work.

Action and Expression

- Allow students to practice safety procedures in a controlled environment before they engage in actual work. Provide opportunities to demonstrate their understanding of safety practices both in and outside the lab.
- Create hands-on activities where students can practice using safety equipment like goggles, gloves, or lab coats. Make sure they demonstrate proper use before allowing them to begin independent tasks.
- Regularly check that students understand and can apply safety procedures. Provide them with safety checklists to complete before they begin any lab activities.
- Ask students to explain the importance of each safety measure and how it contributes to maintaining a safe environment.

Engagement

- Make safety engaging by connecting it to real-life scenarios and the importance of maintaining a safe environment in personal and professional contexts. Help students see the value of safety beyond just classroom rules.
- Discuss real-world examples of laboratory accidents (without graphic content) and show how safety protocols could have prevented those incidents. Relate this to industries like construction, healthcare, or engineering where safety is also critical.
- Create safety challenges where students must identify potential hazards in a mock setup, explaining how they would mitigate each risk using safety procedures.

Supporting Multilingual/English Learners

Related *CELP standards:*	Learning Targets

CELP Standard	LT 1	LT 2	LT 3	LT 4
Emerging	Identifies *one* or *two* common examples of PPE (e.g., gloves, safety glasses) and states a *basic* reason for their use (e.g., "to protect you").	Recognizes that OSHA is an organization related to workplace safety. Might state a simple idea like "they make rules for work."	Identifies *one* or *two* basic rules for safe electrical usage (e.g., "don't touch wires," "don't overload outlets").	Identifies *one* or *two* visible characteristics of a safe work environment (e.g., "clean floor," "no broken things").
Expanding	Explains the *general* purpose of PPE as protecting workers from hazards and can name *several* types of PPE along with the body parts they protect.	Explains that OSHA sets and enforces workplace safety standards to prevent injuries and illnesses. Can identify *some* of OSHA's responsibilities, such as conducting inspections.	Explains *several* rules and guidelines for safe electrical usage, such as proper grounding, avoiding damaged cords, and using appropriate tools. Can describe potential hazards of electrical misuse.	Describes *several* characteristics of a safe work environment, including things like clear pathways, proper lighting, labeled hazards, and accessible safety equipment.
Bridging	Explains the *specific* purpose of different types of PPE in relation to various workplace hazards. Can analyze a work task and determine the appropriate PPE needed and why.	Explains the *comprehensive* role of OSHA in ensuring safe and healthy working conditions, including its standard-setting process, enforcement mechanisms, and worker rights. Can discuss the impact of OSHA on workplace safety.	Applies a *range* of rules and guidelines for safe electrical usage in different scenarios. Can troubleshoot basic electrical safety issues and explain the scientific principles behind safe practices (e.g., grounding paths, circuit overload).	Explains the *systemic* elements that contribute to a safe work environment, including safety protocols, training programs, hazard identification and control measures, and a safety-conscious culture. Can analyze a workplace and suggest improvements to enhance safety.

Lesson Sequence	Learning Target	Success Criteria/Assessment
1	I can explain the purpose of PPE	• I can name different types of PPE to protect the five senses • I can name appropriate PPE types to protect each of the human senses
2	I explain the purpose of OSHA in the workplace	• I can explain the purpose of the organization. • I can explain how OSHA uses training and fines to encourage workplace safety
3	I can apply rules and guidelines of safe electrical usage	• I can explain what the guidelines are for electrical usage. • I can apply safe electric usage rules to a factory setting.
4	I can explain what a safe work environment may look like	• I can explain the importance of lighting and a clean workplace • I can explain the importance of appropriate ventilation in the workplace • I can use safe work practices when working with tools, materials and machines

Unit Title	
Unit 4: Tools and Material Processing	
Relevant Standards: Bold indicates priority	
CCTC - AC -Use architecture and construction skills to create and manage a project. CCTC - AC - Comply with regulations and applicable codes to establish and manage a legal and safe workplace. CCTC - AC-CST - Compare and contrast the building systems and components required for a construction project.	
Essential Question(s)	**Enduring Understanding(s)**
How can I use my previous knowledge of measurements, materials and safety to complete a project?	This is a culminating unit that will ensure students understand: • Accurate measurement is foundational for successful project planning and execution. • Appropriate material selection, informed by understanding material properties, is crucial for creating functional and durable projects. • Adherence to safety protocols is paramount for ensuring well-being and the responsible completion of projects. • The integration of measurement, material knowledge, and safety practices leads to the creation of reliable, long-lasting, and safe outcomes in any project.
Demonstration of Learning	**Pacing for Unit**
• Written documents • Student created project demonstrating culmination of knowledge from entire course	26 Days
Family Overview (link below)	**Integration of Technology**
Tools & Materials - Family Overview (2025)	N/A
Unit-specific Vocabulary	**Aligned Unit Materials, Resources, and Technology (beyond core resources)**
Band saw, table saw, orbital drum sander, belt/disc sander center punch, awl, scroll saw, coping saw, files, sandpaper drill press, drills, hole saw, forstner bit, grit, finishing	N/A
Opportunities for Interdisciplinary Connections	**Anticipated misconceptions**
Association to math when adding and subtracting dimensions	• Measurements do not need to be accurate • Mistakes can't always be fixed - measure twice/ cut once - don't rush
Connections to Prior Units	**Connections to Future Units**
Connection to the units on measurement, materials and safety.	Introductory exposure to tool and materials usage which can be built upon for a subsequent future course
Differentiation through *Universal Design for Learning*	
UDL Indicator and Teacher Actions	
Representation: • Provide visual flowcharts or graphic organizers outlining the steps of the design process. Offer examples of how different projects have moved through these stages. • Create a visual library of tools and machines with clear images, labels, and brief descriptions of their function and safety precautions. Use video demonstrations of proper and safe tool use. • Post clear and visual safety rules and procedures throughout the workshop. Use diagrams and models to illustrate safe practices (e.g., proper attire, emergency procedures, tool handling). • Provide multiple examples of technical drawings with varying levels of complexity. Offer visual aids explaining different drawing conventions (e.g., line types, dimensions, symbols). Use 3D models alongside drawings to aid visualization. • Provide physical samples of sandpaper with different grits clearly labeled. Use visual charts or diagrams that	

show the progression of grits and their typical applications (e.g., rough shaping, fine finishing).

Action & Expression:

- Allow students to choose how they document their progress through the design process (e.g., written journal, video log, digital portfolio). Offer templates or sentence starters for each stage.
- Provide students with opportunities to demonstrate their ability to identify tools and explain their safe usage through hands-on activities, verbal explanations, or creating safety posters/guides.
- Have students participate in safety walkthroughs, identify potential hazards, and demonstrate safe practices during activities. Allow them to create safety checklists or presentations for their peers.
- Provide students with opportunities to practice interpreting drawings by answering questions, labeling parts, or creating simple sketches based on drawings. Allow them to create physical models based on technical drawings.
- Have students sort sandpaper by grit, describe the feel of different grits, and explain when to use each grit for various tasks. Allow them to experiment with different grits on sample materials.

Engagement

- Begin each workshop session with a brief safety review. Use scenarios or case studies to discuss the importance of safety and the consequences of unsafe actions.
- Incorporate "tool talks" or interactive demonstrations where students can handle (safely) and ask questions about different tools. Connect tool usage to real-world projects and applications that students find motivating.
- Use real-world examples of technical drawings for projects that students are working on or find interesting. Incorporate puzzles or challenges that require interpreting drawings to find solutions.

Supporting Multilingual/English Learners

Related *CELP standards:* | **Learning Targets**

CELP Standard	LT 1	LT 2	LT 3	LT 4	LT 5
1. Construct meaning from oral presentations and literary and informational text	Understanding the steps of the design process	Understanding information about tools and safety	Understanding workshop safety rules	Understanding information in technical drawings	Understanding information about sandpaper grits
2. Participate in grade-appropriate oral and written exchanges of information, ideas, and analyses	Discussing design ideas and process with others	Discussing tool usage and safety with others	Discussing safety concerns and procedures	Discussing interpretations of technical drawings	Discussing sandpaper types and applications
3. Speak and write about grade-appropriate complex literary and informational texts and topics	Explaining the stages of the design process	Explaining the safe operation of various tools	Explaining the rationale behind safety practices	Explaining the information conveyed in drawings	Explaining the science behind sandpaper grits
4. Construct grade-appropriate oral and written claims and support them with reasoning and evidence	Justifying design choices based on the process	Justifying the safe usage procedures for tools	Justifying adherence to safety rules	Justifying interpretations of drawing features	Justifying the selection of specific sandpaper grits
5. Conduct research and evaluate and communicate findings to answer questions or solve problems	Researching design methodologies	Researching tool operation and safety guidelines	Researching best workshop safety practices	Researching drawing conventions and standards	Researching sandpaper properties and applications
6. Analyze and critique the arguments of others orally and in writing	Evaluating the effectiveness of different designs	Evaluating the safety explanations of others	Evaluating adherence to safety by others	Evaluating the accuracy of drawing interpretations	Evaluating the appropriateness of sandpaper choices
7. Adapt language choices to purpose, task, and audience when speaking and writing	Explaining the design process to different groups	Explaining tool safety to different audiences	Explaining workshop safety to different groups	Explaining technical drawings to different audiences	Explaining sandpaper grits to different audiences
8. Determine the meaning	Understanding	Understanding	Understanding	Understanding	Understanding

of words and phrases in oral presentations and literary and informational text	design-related terminology	tool names and safety terms	workshop safety vocabulary	technical drawing vocabulary	sandpaper-related terms
9. Create clear and coherent grade-appropriate speech and text	Explaining the design process clearly	Explaining tool safety clearly	Explaining workshop safety clearly	Explaining technical drawings clearly	Explaining sandpaper grits clearly
10. Make accurate use of standard English to communicate in grade appropriate speech and writing	Using correct terminology for design	Using correct terminology for tools and safety	Using correct safety terminology	Using correct technical drawing terminology	Using correct terminology for sandpaper

Lesson Sequence	Learning Target	Success Criteria	Assessment
1	I can properly use the design process to design a project.	• I can explain the steps of the design process. • I can use the design process to create a product to be manufactured.	Formative assessment, written response, push tool project (5 days)
2	I can properly identify hand/ power tools as well as machines and explain their safe usage to complete a project.	• I can correctly name and describe the function of each tool and machine used in my project. • I can explain the proper handling and operation of each tool and machine.	Formative assessment, project completion (10 days)
3	I can follow safe workshop practices expected in the laboratory	• I can work independently or collaboratively while maintaining a safe work environment.	Formative assessment, project completion
4	I can read and interpret the information contained in a technical drawing to create an object	• I can differentiate the different views on a technical drawing • I can understand the relationship between lines and surfaces of a part between views on a technical drawing • I can accurately read a technical drawing to obtain measurements and annotations of features on an object	Formative assessment, exit slip, quiz
5	I can distinguish between the different sandpaper grits and their usage.	• I can correctly identify different sandpaper grits by their number (e.g., coarse: 40-60, medium: 80-120, fine: 150-220, extra fine: 240+) • I can apply proper sanding techniques, including sanding with the grain and using even pressure. • I can maintain a clean work area by managing dust and debris properly.	Formative assessment, project completion