

## **Introduction to Residential & Commercial Construction (Pathway 123) CALPADS 7340**

This course will introduce students to career opportunities within the Building and Construction Trades sector and focuses on the manner in which residential and commercial structures are designed and built. The course covers construction and building design, performance, sustainability, the study of safety, hand and power tools, planning and design, applicable mathematics, blueprint reading, trade nomenclature, residential and commercial construction standards and other specialized skills. This course includes preparation for a Class B California License. (General Building Contractor)

### **Industries / Pathways**

- Building and Construction Trades
- Residential and Commercial Construction

### **Grade Levels**

- 10, 11, 12

### **CSU/UC Approval: No**

### **California's 2013 CTE Standards**

- **CTE.BCT.B.11.3** Demonstrate understanding of California Environmental Quality Act (CEQA) and Environmental Impact Reports (EIRs) as they apply to heavy construction, including highway and bridge projects.
- **CTE.BCT.B.1.5** Understand the importance and impact of environmental concerns and regulations in relation to building site preparation.
- **CTE.BCT.KPAS.10.1** Interpret and explain terminology and practices specific to the Building and Construction Trades sector.
- **CTE.BCT.KPAS.10.3** Construct projects and products specific to the Building and Construction Trades sector requirements and expectations.
- **CTE.BCT.KPAS.4.5** Research past, present, and projected technological advances as they impact a particular pathway.
- **CTE.BCT.KPAS.5.2** Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate.
- **CTE.BCT.D.9.2** Identify materials used in building construction to increase energy efficiency and sustainability.
- **CTE.BCT.D.9.1** Identify design and energy solutions for improving building energy efficiency.
- **CTE.BCT.D.9.4** Demonstrate the application of constructing materials intended to improve building efficiency and sustainability.

- **CTE.BCT.D.2.1** Apply formulas to determine area, volume, lineal, board, and square feet.
- **CTE.ANR.A.7.4** Explore the impact of advertising, promotion, and data analysis on the marketing of agricultural products and services.
- **CTE.ANR.KPAS.10.3** Construct projects and products specific to the Agriculture and Natural Resources sector requirements and expectations.
- **CTE.ANR.KPAS.10.2** Comply with the rules, regulations, and expectations of all aspects of the Agriculture and Natural Resources sector.
- **CTE.ANR.KPAS.8.2** Identify local, district, state, and federal regulatory agencies, entities, laws, and regulations related to the Agriculture and Natural Resources industry sector.
- **CTE.ANR.KPAS.8.7** Conform to rules and regulations regarding sharing of confidential information, as determined by Agriculture and Natural Resources sector laws and practices.
- **CTE.ANR.KPAS.4.7** Demonstrate the use of appropriate tools and technology used in the Agriculture and Natural Resources sector.
- **CTE.ANR.B.6.2** Practice bed preparation, concrete forms layout, and construction.
- **CTE.ANR.B.6.1** Identify and explain the use of concrete and masonry tools and demonstrate proper handling of concrete materials.
- **CTE.ANR.B.6.3** Complete a concrete or masonry project, including calculating volume, developing a bill of materials, assembling, mixing, placing, and finishing.
- **CTE.EA.B.6.1** Understand the steps in the design process.
- **CTE.EA.B.6.3** Choose between alternate solutions in solving a problem and be able to justify the choices made in determining a solution.
- **CTE.EA.B.6.6** Construct a prototype from plans and test it.
- **CTE.EA.B.3.4** Understand how electrical control and protection devices are used in electrical systems.
- **CTE.EA.B.3.2** Analyze relationships between voltage, current, resistance, and power related to direct current (DC) circuits.
- **CTE.EA.B.1.1** Explain the classification and use of various components, symbols, abbreviations, and media common to technical drawings.
- **CTE.EA.B.1.3** Draw flat layouts of a variety of objects by using the correct drafting tools, techniques, and media.
- **CTE.EA.B.2.3** Present conceptual ideas, analysis, and design concepts using freehand graphic communication techniques.
- **CTE.EA.B.2.2** Apply sketching techniques to a variety of architectural and engineering models.
- **CTE.EA.A.7.3** Evaluate available building materials (e.g., steel, concrete, and wood) by considering their properties and their effect on building form.
- **CTE.EA.D.8.3** Apply the concepts of environmental and natural science to the tools, equipment, projects, and procedures of the Environmental Engineering Pathway.

- **CTE.EA.KPAS.5.3** Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment.
- **CTE.EA.KPAS.5.1** Identify and ask significant questions that clarify various points of view to solve problems.
- **CTE.EA.KPAS.2.5** Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- **CTE.HSMT.D.7.11** Discuss policies and procedures to monitor, distribute, and consume materials.
- **CTE.HSMT.C.9.3** Archive and purge documents following policies and regulatory guidelines.
- **CTE.EEU.A.12.4** Create an environmental law or regulation and explain how it will impact the environment.
- **CTE.EEU.A.12.3** Compare and contrast environmental laws and regulations that may have a positive or negative impact on the environment and the economy.
- **CTE.T.C.1.1** Know and understand common environmental conservation practices and their applications
- **E13.3** Compare the role of public and private property rights and how they affect agriculture.
- **C2.2** Explain current environmental challenges related to agriculture.
- **C1.4** Research the economic impact of leading California agricultural commodities.
- **G6.1** Understand soil types, soil texture, structure, and bulk density and explain the U.S. Department of Agriculture (USDA) soil-quality rating procedure.

#### **California's 2008 CTE Standards**

- **CTE.MPD.FS.11.0** Demonstration and Application
- **CTE.MPD.FS.1.0** Academics
- **CTE.EU.B.B1.1** Know how to classify various conventional energy resources by depletable, nondepletable, renewable, and nonrenewable type.
- **CTE.EU.B.B1.2** Know the new and emerging energy resources.
- **CTE.EU.D.D3.6** Know the basic principles of industry documents, records, and forms associated with residential and commercial energy and utility industries.
- **CTE.EU.D.D3.7** Know the importance of the business and consumer relationship and consumer rights concepts associated with residential and commercial energy and utility industry products and services.
- **CTE.EU.D.D5.0** Students understand and apply procedures and processes related to a residential and commercial energy and utility project:
- **CTE.EU.D.D4.0** Students understand specific career preparation and planning requirements for employment in the residential and commercial energy and utility industry and how these requirements apply across all standards for students planning to successfully enter and advance in the industry:

- **CTE.EU.FS.4.1** Understand past, present, and future technological advances as they relate to a chosen pathway.
- **CTE.EU.A.A2.6** Understand basic process measurement systems.
- **CTE.BTC.FS.2.0** Communications
- **CTE.BTC.FS.11.0** Demonstration and Application
- **CTE.BTC.FS.1.0** Academics
- **CTE.BTC.FS.6.2** Understand critical elements for health and safety practices related to storing, cleaning, and maintaining tools, equipment, and supplies.
- **CTE.BTC.FS.10.7** Understand the attributes of good design.
- **CTE.BTC.FS.10.1** Understand construction processes and systems and their importance in construction technology.
- **CTE.BTC.B.B1.2** Calculate the required materials, such as soils, aggregate, asphalt, concrete, and pipe, for engineering and heavy construction applications.
- **CTE.BTC.B.B1.5** Know the use of conventional engineering and heavy construction mathematical functions to calculate on-site preparation and site development and improvement materials.
- **CTE.BTC.D.D7.1** Understand significant historical trends in the construction industry.
- **CTE.BTC.D.D7.3** Understand the environmental regulations that influence residential and commercial design.
- **CTE.BTC.D.D2.2** Maintain and care for hand tools used in residential and commercial construction.
- **CTE.BTC.D.D2.1** Use the common hand tools of the trade, such as hammers, torches, pliers, wire cutters, pipe cutters, saws, chisels (wood and concrete), and wrenches, safely and properly.
- **CTE.BTC.D.D5.1** Understand the safe use of electrical connection methods and electrical wiring procedures.
- **CTE.BTC.D.D5.2** Know the safety procedures and practices in various work environment settings pertaining to residential and commercial construction.
- **CTE.BTC.D.D1.4** Apply conventional construction measurement processes accurately (geometric and trigonometric functions).
- **CTE.BTC.D.D1.5** Know the use of conventional construction formulas to determine production requirements.
- **CTE.BTC.D.D1.1** Identify design solutions for residential construction problems.
- **CTE.BTC.D.D1.3** Convert scaled blueprint drawing measurements to full dimensions for a given construction project.
- **CTE.BTC.D.D1.2** Calculate required materials for residential construction applications.
- **CTE.BTC.D.D4.4** Solve common residential construction problems, such as framing, plumbing, and electrical, by using the official codes adopted by the state and local building standards commission.
- **CTE.BTC.D.D4.3** Understand the sequencing of events for specific construction projects.

- **CTE.BTC.D.D4.2** Understand how to estimate materials from blueprints and specifications.
- **CTE.BTC.D.D4.1** Interpret and use residential construction blueprints and specifications.

**CTE.BTC.D.D6.2** Understand the processes and materials (e.g., structural, electrical, mechanical, finish) appropriate to the architectural design and residential construction

- **CTE.BTC.D.D6.4** Understand the phases of residential and commercial construction.
- **CTE.BTC.D.D3.1** Use portable power tools, such as circular saws, table saws, saber saws, drills, planers, and sanders, safely and properly.
- **CTE.BTC.D.D3.3** Maintain and care for portable power tools and portable pneumatic tools.
- **CTE.BTC.D.D3.2** Use portable pneumatic tools, such as rough framing nail guns, interior finishing and brad nail guns, hammers, impact wrenches, drills, and compressors, safely and appropriately.
- **CTE.BTC.A.A4.1** Understand the proper and safe use of stationary power tools used in the milling process, such as shapers, sanders, joiners, table saws, and band saws.
- **CTE.BTC.A.A2.2** Maintain and care for common hand tools.
- **CTE.BTC.A.A2.1** Use common hand tools and accessories, such as planers, shapers, clamping and gripping tools, pliers, wrenches, wood chisels, hammers, hand saws, and squares, safely and properly.
- **CTE.BTC.A.A1.4** Know conventional cabinetmaking and wood product measurement processes, linear measurements, and conversions of fractions and decimals.
- **CTE.BTC.A.A1.2** Understand calculation procedures for materials and production requirements for wood product designs.
- **CTE.BTC.A.A6.1** Know the safety rules in the cabinetmaking work environment.
- **CTE.BTC.A.A6.2** Use hand tools (wood chisels, drills, coping saws) and power tools (routers, sanders, planers) safely in the cabinet working environment.
- **CTE.BTC.A.A3.2** Use pneumatic tools, such as pneumatic clamps, grips, framing nail guns, and finishing and brad nail guns, safely and properly.
- **CTE.BTC.A.A3.1** Use portable power tools, such as single and compound miter saws, drills, sanders, saber saws, and routers, safely and appropriately.
- **CTE.BTC.A.A3.3** Maintain and care for portable power and pneumatic tools.
- **CTE.ANR.FS.6.5** Use tools and machines safely and appropriately.

### **Next Generation Science Standards**

- **HS-PS3-3** Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

- **HS-PS3-4** Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).
- **HS-ESS3-4** Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
- **SEP.AID.AK.A** Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
- **SEP.CEDS.CK.D** Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.
- **SEP.CEDS.CK.D** Design a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.
- **SEP.OECI.OK.C** Communicate scientific ideas (e.g. about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).
- **SEP.SMLMTENP.T** Theories and laws provide explanations in science.
- **SEP.UMCT.MKS.U** Use mathematical representations of phenomena to support claims.
- **DCI.PS3.D.S** Solar cells are human-made devices that likewise capture the sun's energy and produce electrical energy.
- **DCI.ETS1.A.PTD** Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.
- **DCI.ETS1.B.DT** Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.
- **DCI.ETS1.B.M** Models of all kinds are important for testing solutions.
- **DCI.ETS1.B.T** Testing a solution involves investigating how well it performs under a range of likely conditions.
- **DCI.ETS1.C.B** Because there is always more than one possible solution to a problem, it is useful to compare and test designs.
- **CC.CE.S** Simple tests can be designed to gather evidence to support or refute student ideas about causes.
- **CC.SPQ.S** Standard units are used to measure and describe physical quantities such as weight and volume.
- **CC.EM.E** Energy can be transferred in various ways and between objects.

- **CC.ISET.S** Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process.
- **CC.SHE.M** Most scientists and engineers work in teams.

### California Math Common Core Standards

- **7.G.1** Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
- **8.G.7** Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
- **7.RP.1** Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.
- **F.BF.5 (+)** Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.
- **G.MG.3** Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with topographic grid systems based on ratios).

### California English Common Core Standards

- **RST.9-10.2** Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
- **RST.9-10.3** Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- **RST.11-12.4** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11—12 texts and topics.
- **RST.9-10.7** Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- **RST.9-10.9** Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
- **RST.11-12.9** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

- **W.9-10.5** Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
- **W.9-10.6** Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
- **W.11-12.6** Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
- **W.9-10.8** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation including footnotes and endnotes.
- **W.11-12.7** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- **WHST.9-10.4** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- **WHST.11-12.6** Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
- **WHST.9-10.7** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- **SL.7.1** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.
- **SL.9-10.4a** Plan and deliver an informative/explanatory presentation that: presents evidence in support of a thesis, conveys information from primary and secondary sources coherently, uses domain specific vocabulary, and provides a conclusion that summarizes the main points. (9th or 10th grade)

### California Academic Content Standards

- **ELA.9-10.W.RT.1.8** Design and publish documents by using advanced publishing software and graphic programs.
- **ELA.9-10.W.RT.1.3** Use clear research questions and suitable research methods (e.g., library, electronic media, personal interview) to elicit and present evidence from primary and secondary sources.

- **ELA.9-10.LS.2.3f** Apply appropriate interviewing techniques that compile and report responses.
- **ELA.9-10.LS.2.6c** Deliver descriptive presentations that use effective, factual descriptions of appearance, concrete images, shifting perspectives and vantage points, and sensory details.
- **ELA.9-10.R.SFL.3.2** Compare and contrast the presentation of a similar theme or topic across genres to explain how the selection of genre shapes the theme or topic.
- **ELA.9-10.R.CAGT.2.6** Demonstrate use of sophisticated learning tools by following technical directions (e.g., those found with graphic calculators and specialized software programs and in access guides to World Wide Web sites on the Internet).
- **ELA.9-10.R.CAGT.2.5** Extend ideas presented in primary or secondary sources through original analysis, evaluation, and elaboration.
- **ELA.8.W.2.5b** Write documents related to career development, including simple business letters and job applications that follow the conventional format for the type of document (e.g., letter of inquiry, memorandum).
- **ELA.8.R.SFIM.2.1** Compare and contrast the features and elements of consumer materials to gain meaning from documents (e.g., warranties, contracts, product information, instruction manuals).
- **ELA.8.R.CAGT.2.5** Understand and explain the use of a complex mechanical device by following technical directions.
- **ELA.8.R.VCD.1.3** Use word meanings within the appropriate context and show ability to verify those meanings by definition, restatement, example, comparison, or contrast.
- **ELA.7.R.CAGT.2.5** Understand and explain the use of a simple mechanical device by following technical directions.
- **M.7.MG.1.2** Construct and read drawings and models made to scale.
- **M.7.MG.1.1** Compare weights, capacities, geometric measures, times, and temperatures within and between measurement systems (e.g., miles per hour and feet per second, cubic inches to cubic centimeters).
- **M.7.MG.2.1** Use formulas routinely for finding the perimeter and area of basic two-dimensional figures and the surface area and volume of basic three-dimensional figures, including rectangles, parallelograms, trapezoids, squares, triangles, circles, prisms, and cylinders.
- **M.7.MG.2.2** Estimate and compute the area of more complex or irregular two- and three-dimensional figures by breaking the figures down into more basic geometric objects.
- **M.7.NS.2.2** Add and subtract fractions by using factoring to find common denominators.
- **M.5.NS.2.5** Compute and perform simple multiplication and division of fractions and apply these procedures to solving problems.

- **M.5.NS.2.3** Solve simple problems, including ones arising in concrete situations, involving the addition and subtraction of fractions and mixed numbers (like and unlike denominators of 20 or less), and express answers in the simplest form.
- **M.6.MG.1.2** Know common estimates of  $\pi$  (3.14;  $22/7$ ) and use these values to estimate and calculate the circumference and the area of circles; compare with actual measurements.
- **M.6.NS.2.1** Solve problems involving addition, subtraction, multiplication, and division of positive fractions and explain why a particular operation was used for a given situation.
- **M.6.NS.1.1** Compare and order positive and negative fractions, decimals, and mixed numbers and place them on a number line.
- **M.6.AF.3.1** Use variables in expressions describing geometric quantities (e.g.,  $P = 2w + 2l$ ,  $A = 1/2bh$ ,  $C = \pi d$  - the formulas for the perimeter of a rectangle, the area of a triangle, and the circumference of a circle, respectively).
- **M.6.MR.1.2** Formulate and justify mathematical conjectures based on a general description of the mathematical question or problem posed.
- **M.8-12.A.2.0** Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They understand and use the rules of exponents.
- **M.8-12.A.13.0** Students add, subtract, multiply, and divide rational expressions and functions. Students solve both computationally and conceptually challenging problems by using these techniques.
- **M.8-12.A.5.0** Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.

### Competencies / Outcomes

- Review industry standards and career opportunities
- Review the course competencies
- Review teacher and student expectations
- Read and understand material safety data sheets (MSDS).

Describe and demonstrate general safety procedures Identify and demonstrate personal safety procedures Defend and demonstrate tool and machine safety procedures Identify and describe proper accident and emergency procedures Support and demonstrate proper fire safety Demonstrate safe and proper operation of hand and power tools such as pneumatic, electrical and cordless Identify and describe the proper care, maintenance, storage and transportation of hand and power tools Calculate the area of geometric shapes Demonstrate how to calculate board feet Describe and demonstrate linear measurement Identify and describe grades of lumber Develop and demonstrate pattern construction Defend and demonstrate material conservation Identify and describe standard architectural and electrical symbols Demonstrate proper blueprint reading skills Describe site layout and excavation Compare and classify materials such as woods, composition materials, drywall, roofing materials, flooring

materials, glass plastic laminates and sheet metal Identify and describe permissible uses of the materials listed Identify and defend code restrictions related to the materials listed Demonstrate safe cutting techniques for the materials listed Identify and describe proper moving Calculate material cost for a project including shipping and delivery Identify and review local labor costs and contracts Calculate labor costs for a project Describe the process for obtaining a building permit and how inspections relate to the building process Identify and describe consumer protection related to the construction industry Identify appropriate uses of drywall Compare and contrast drywall and plaster Practice safe cutting techniques for drywall Install drywall in various locations Apply safe removal techniques of existing flooring such as ceramic, asphalt tile, hardwoods, linoleum and carpet Identify and use safe installation techniques on flooring such as ceramic, asphalt tile, hardwoods, linoleum and carpet Compare and contrast types of finish and paint preparation Identify proper masking techniques Analyze and use painting and finishing methods such as brush, roller, spray gun and color matching Describe proper disposal and clean-up procedures for paint and finish related materials Differentiate the purpose of the major components of a heating ventilation air conditioning (HVAC) system Correctly evaluate the operation of blower motors and thermostatic controls Diagnose simple HVAC component malfunction Determine safe and correct HVAC component repair and replacement procedures Assess assorted plumbing materials such as copper, galvanized and PVC Apply safe and proper installation techniques for natural gas appliances Differentiate assorted faucet types, toilet types, sink and tub types and related installations and repairs Implement safe and proper drain cleaning techniques Utilize proper installation techniques for rolled and blown insulation Apply safe and proper installation techniques for door and window insulation Practice air-tight door hanging Mix and use concrete Mix and apply grouting Describe and demonstrate safe and proper replacement and repair of concrete slabs framing and finishing Describe and demonstrate safe and proper repair of drywall and plaster walls Discuss career paths and goal setting Complete a data sheet and career-interest testing Complete a job application Create an error-free résumé Create a portfolio Complete a mock interview Students will learn what ingredients and additives go into concrete. Estimate how much concrete material is required for a specific area. Proper way to set anchor bolts/and what role they play. Understand what role rebar plays in concrete Calculate how much re-bar is needed for a job. Build a small-scale stem wall.

### Prerequisites

None

### Units

10

### Class Orientation

The students will receive training in the basis of the construction industry. They will learn machine and tool safety as well as all facets in the building trade. Students will

learn how to enter the work force, build a foundation, frame walls, roofs and install windows and doors. The students will also be introduced to Green Building basics. In the end of the course, the students will receive a competency certificate to help them in gaining employment in the industry.

**Classroom**

120 Minutes

**Careers in Wood Technology**

Students will be introduced to possible career opportunities available in the woodworking and construction fields.

**Classroom**

2 Hours

**Employment Portfolio for SkillsUSA**

Jobs, work habits and ethics. Communication skills and employee responsibilities

**Classroom**

10 Hours

Projects

- Employment Portfolio Unit

**Measuring**

This unit will address how measurement is used in the lab. How to measure and the units of measurement.

**Classroom/Lab**

2 Hours

Lesson Plans

- Reading a tape measure
- The Paper Inch

**Machine Safety and Operation in the Wood, Cabinetmaking, and Construction Lab**

This unit will consist of safety lessons created by experienced teachers in the field. Each lesson will explain the safe and proper use of the machine or tool.

**Classroom/Lab**

20 Hours

Lesson Plans

- Band Saw Safety
- Portable Router
- Jointer safety practices
- Portable Circular Saw
- Pneumatic Tools (staplers & nailers) and Compressed Air

- Belt Sander Safety
- Ram Set Safety Lesson
- Router Safety
- Hand Tool Safety
- Jig Saw Safety
- Miter Saw / Chop Saw Safety
- Lathe Safety
- Sliding Compound Miter Saw Safety
- Masonry Brick, Block, and Stone Wet Saw
- Occupational Safety Overview

### Wood Joints

Students will be taught common wood joints used to attach pieces of wood together. Various types of butt, dado, rabbet, miter, dove-tail, scarf, and lap joints will be learned.

**classroom / lab**

8 Hours

### Finishing

Students will be introduced to sanding, staining, and lacquering practices. Spraying techniques is taught.

**Classroom / lab / finish room**

4 Hours

### Cabinet Types and Construction

Students will learn common designs and features of base, wall, and specialty cabinets.

**Classroom / lab**

4 Hours

### Construction Building Materials

Various types of building materials will be introduced to the students. Framing materials, flat stocks, fasteners, and roofing materials will be stressed.

**Classroom and Laboratory**

120 Minutes

Lesson Plans

- Estimating Concrete Curb and Gutter
- Concrete Surfaces ? What's on the Outside is What Counts - Partial Lesson  
Depicting the Importance of the Hook Activity.
- How many trees to build my house?

### Building Codes and Standards

Students will be introduced to nailing patterns, Simpson connectors, and strong building practices.

**Classroom**

240 Minutes

Lesson Plans

- Residential Foundation and Wall Framing Codes & Standards
- Residential Floor, Ceiling, and Roof Framing Requirements
- Zoning Code and Standards

### Introduction to Blueprints

Students will show understanding of residential plans. Material cut lists will be produced from these drawings.

**Classroom**

180 Minutes

Lesson Plans

- Introduction to Blueprints

### Materials and Fasteners

The students will learn the various parts of a tree and its growth cycle. They also learn the difference between Hardwoods and Softwoods.

**Classroom**

5 Class Periods

Lesson Plans

- Hardwoods and Softwoods
- Tree Parts

### Masonry

The students will learn the basics in masonry. They will learn terminology, tool use, and building basics using brick and block.

**Classroom**

15 Class Periods

Lesson Plans

- Masonry Tools
- Brick Terminology Web Quest
- Entry Level Build Portfolio/ Build 1: Towers
- Entry Level Build Portfolio/ Build 2: Stack Bond
- Entry Level Portfolio/Build 3: Running 50/50
- Entry Level Portfolio/Build 4: Stack Soldier
- Entry Level Portfolio/Build 5: Basket Weave Column
- Entry Level Portfolio/Build 6: Four Brick Column

- Entry Level Portfolio/Build 7: Pinwheel Column
- Entry Level Portfolio/Build 8: Block Stack Bond
- Entry Level Portfolio/Build 9: Running Block
- Entry Level Portfolio/Build 10: Block Corner Lead
- Entry Level Portfolio/Build 11: Block Columns

### **Residential Concrete: The World of Foundations**

Throughout this unit, students will dive in to the world of foundations! They will be learning all about concrete, from the proper way to mix it in, to why it plays such a huge role in everyday life. Students will learn about rebar and why concrete would not be as strong without it, and learn to identify the different sizes of rebar by knowing the measurements. There is also some great trade-related math that gives the students a chance to learn the proper way to calculate how much rebar is needed for a job and to calculate how much concrete is needed. Scientists and engineers continue to create ways to improve concrete as a building material.

In addition to the CTE/STEM focus of the unit/project lessons, educators will find academic lessons in Math and English Language Arts (ELA) that supplement the primary core area of study.

- The Science and Math lessons will show students how concrete has become an integral part of sustainable home design and home energy performance.
- Students will also learn how engineers calculate insulation values for different materials and how materials such as concrete, wood, styrofoam can be used in combination together to end up with a better insulating value and overall durable structure.
- Students will get a chance to better understand the way heat moves and flows in a home based on the design of the home. Students will also learn how to calculate the conductive heat flow and make comparisons to the way different building materials allow heat to conduct within a structure.

#### **CTE**

13 - 14 Hours

#### **Math**

3 - 4 Hours

#### **ELA**

9 - 10 Hours

#### **Lesson Plans**

- What's in the Mix? The Components of Cement (CTE)
- How Much Rebar? (CTE)
- Slump Test: Concrete Foundations Culminating Lesson
- Project Research: The History of Concrete
- What's the "Value": Comparing R value and U value of Concrete and other Common Materials (Math)
- Calculating Conductive Heat Flow And Concrete Wall Analysis (Math)

- Compare & Contrast Essay: Concrete With and Without Fly-Ash (ELA)
- Official Documents, Forms, and Checklists (ELA)
- Working with Concrete- The Slump Test

### **Residential Concrete : Foundations and Form**

In these lessons students will be learning about the Pythagorean Theorem, the importance in anchor bolts and the proper way to mix concrete. They will also learn how to mix concrete to do a slump test, and learn what and why slump tests are so important. The culminating lesson is a great way for the students to showcase all that they have learned by building a small scale form, use tie wire as rebar to reinforce their form, dry set machine bolts at the proper locations acting like anchor bolts, and mix concrete in large amounts that will be used to do a mine pore into their small scale forms that they have already built.

In addition to the CTE/STEM focus of the unit/project lessons, educators will find academic lessons in Math, Science and English Language Arts (ELA) that supplement the primary core area of study.

The structure of this unit and the materials contained within it were created by Evan Clark (CTE), David Grant (Science), and Lora Hunter (ELA) with support from the CTE Online curriculum leadership team and detailed coordination provided by the Course Specialist Gregg Witkin.

#### **CTE**

15 Hours

#### **Math**

5 Hours

#### **ELA**

20 Hours

#### **Lesson Plans**

- How to Check for Squareness
- Anchor Bolts
- Mixing it Up
- Culminating Lesson: The Form
- Career Preparation in Building Construction (ELA)
- Sustainable Design With Concrete (Science)
- Thermodynamics and Concrete Floors and Walls (Science)

### **Forms**

Students will be shown how to set up forms to safely pour concrete.

#### **Classroom and Lab**

120 Minutes

### **Floor Framing**

Students will identify floor framing components, and use the parts to build a floor.

#### **Classroom**

1 Hour

#### Lesson Plans

- Introduction To Basic Floor Framing

#### Wall Framing

Students will identify wall framing components, and use the parts to frame a wall, door opening windows, trusses, and rafters. They will learn the process of building a house structure through a model (scale) house.

#### Class and Lab

15 weeks

#### Lesson Plans

- The Wall (Framing Glossary)
- Assembling the Model Framed Wall
- Constructing a Model Wood Framed Wall - Lesson #1
- Model Wall Framing Plate Lay-out and Door and Window Construction - Lesson #2
- Assembly of a Model Wooden Framed Wall - Lesson #3
- Building the Model Wood Framed House - Lesson # 4
- Rising the Model Houses Walls - Lesson # 5
- Construction of Roof Truss - Lesson # 6
- Installation of the Roof Trusses - Lesson # 7
- Installing Hip and Valley Rafters - Lesson # 8
- Installing the Roof Look-outs, Fascia and Sheathing - Lesson # 9

#### Roof Framing

Students will identify roof framing components, and use the parts to frame a roof.

#### Classroom and Lab

120 Minutes

#### Lesson Plans

- Seat Cut / Bird's Mouth Application

#### Roof Finishes

The students will learn the process used to apply flashings, tar paper, and composition shingles to a roof.

#### Classroom and Lab

120 Minutes

#### Exterior Walls and Trim

Students will learn different types of sidings available, as well as ways to trim out the wall.

## **Classroom and Lab**

60 Minutes

### **Windows and Exterior Doors**

Proper procedures will be demonstrated to install windows and doors.

## **Classroom and Lab**

180 Minutes

Lesson Plans

- Door installation (pre-hung doors)

### **Insulation**

Students will learn how to install insulation batting. Various insulation options will be discussed.

## **Classroom and Lab**

60 Minutes

### **Drywall**

Students will practice hanging and finishing drywall.

### **Electrical Wiring**

Students will be introduced to hanging electrical boxes, routing wires, and connecting receptacles and switches.

## **Classroom and Lab**

120 Minutes

### **Green Construction**

Construction dealing with "Green" concepts, procedures and projects. This unit serves as a mere introduction to the concepts and approaches being actively shaped in the field and are not intended to be a comprehensive learning experience for Green technologies and production practices.

This unit includes two CTE/STEM Integrated Projects: Solar Duino House, and Green is the New Black.

## **Classroom**

5 Class Periods

Lesson Plans

- Green Building Basics
- Passive Solar Design using Google Sketch-Up
- Introduction to the Solar Duino House
- Programming & Wiring Solar Duino House
- Solarizing the Solar Duino
- Solar Duino Building, Testing & Modifications
- Blueprints (CTE)

- Green Technologies (CTE)
- Green Products (CTE)
- Construction (CTE)

#### Projects

- Solar Duino House STEM Integrated Project
- Green is the New Black - Green Building Design STEM Integrated Project

#### Developing an Environmental Impact Report

In the PBL Project "Developing an Environmental Impact Report," students will develop an Environmental Impact Report by analyzing a site before a construction project is being proposed. Students will test the soil quality, observe natural surroundings, wildlife currently living at the site, learn about the public policy of building construction, and inform the community and city officials of the impacts before we place "that" there.

#### Lesson Plans

- What's the Dirt on Dirt? Environmental Impact Reports
- What Used to Be There? Environmental Impact Reports
- Playing the Lorax - Environmental Impact Reports
- Creation of the Environmental Impact Report

#### Projects

- Developing an Environmental Impact Report PBL Project