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Berkeley Technology Academy (BTA) **Construction Technology** Curriculum

BTA CONSTRUCTION TECHNOLOGY

PROGRAM GOALS

The goal of the program is to develop students' academic and technical skills, preparing them for:

- College
- Advanced training
- Employment and opportunities for promotion

COURSE TITLE:	CONSTRUCTION TECHNOLOGY
CBEDS TITLE/NO:	RESIDENTIAL COMMERCIAL CONSTRUCTION — 5502
SECTOR/PATHWAY:	Building Trades and Construction Industry Sector; Residential and Commercial Construction Career Pathway
JOB TITLE/ONET CODES:	47-2031.01 - Construction Carpenters 47-2031.02 - Rough Carpenters 47-3012.00 - Helpers—Carpenters 47-2111.00 - Electricians 47-2081.00 - Drywall and Ceiling Tile Installers 47-2141.00 - Painters, Construction and Maintenance 47-2152.02 - Plumbers 47-2181.00 - Roofers 11-9021.00 - Construction Managers

I. COURSE DESCRIPTION

Students have hands-on opportunities to learn all phases of basic residential construction, including carpentry, drywall, electrical, flooring, painting, plumbing, roofing, masonry, and reading blueprints. During the first part of the course, students learn about construction safety, foundations, framing, and proper use of tools. Then students have the opportunity to make practical application of their classroom studies on a construction project. Projects may include building sawhorses, scale model houses, storage sheds, remodeling (on or off-site), simulated bathroom construction, and other projects as available.

This competency-based course prepares students for entry-level positions in the construction industry. Integrated throughout the course are career technical education standards which include basic academic skills, communication, career planning, technology, problem solving, safety, responsibility, ethics, teamwork, and technical knowledge.

Hours:	Students receive up to 540 hours of classroom and field-site instruction
Prerequisites:	Student must be at least 16 years old; or a Junior or Senior
Date revised:	January 25, 2010
Academic Credit:	Elective credit given at each high school upon completing course with passing grade

II. STUDENT PERFORMANCE OBJECTIVES

Upon successful completion of the course, students will:

1. Understand and apply measurement systems in the planning and layout process used in the residential construction industry.
2. Demonstrate the safe and appropriate use of hand tools common to the construction industry, such as hammers, torches, pliers, wire cutters, pipe cutters, saws, chisels, and wrenches
3. Demonstrate safe and appropriate use of power tools common to the construction industry, such as band saw, saber saw, miter compound saw, radial arm saw, table saw, jig saw, cut-off saw, reciprocating saw, portable drill, drill press, planer, roto hammer, router, jointer, belt sander, and finishing sanders
4. Interpret residential construction blueprints and specifications
5. Practice occupational safety on the construction site, whether classroom or job site
6. Demonstrate competency in the mathematics used in measuring and estimating the materials needed for a job
7. Demonstrate communication, teamwork, and leadership skills in project development
8. Demonstrate familiarity with skills in the following areas: carpentry, electrical wiring, plumbing, masonry, plastering
9. Identify different building materials and types of wood used in construction
10. Understand the process of building layout, foundations, and framing
11. Understand the career pathways available in the construction trades, including further training and apprenticeship opportunities
12. Complete class projects, such as:
 - Read and draw plans for various projects
 - Build and frame a full wall section, a full-size roof frame, a 2' x 2' model house, or a storage shed
 - Sheetrock a wall and a partition; patch and repair; paint the wall
 - Build mock-up for wiring system, including wiring outlets and lights
 - Build mock-up for plumbing system; weld or solder copper tubing and plastic ABS tubing

Expected School-wide Learning Results

1. Demonstrate effective skills in oral and written communication.
2. Demonstrate job skills and the behavior and work ethic valued by employers.
3. Demonstrate the ability to be critical, complex, and creative thinkers.
4. Work productively both as individuals and as team members.

III. COURSE OUTLINE (Standards are from the *California Career Technical Education Model Curriculum Standards* adopted by the State Board of Education)

<i>Course Outline</i>	<i>Career Technical Education Standards</i>	<i>Suggested Activities/Assessment</i>
A. Introduction (10-20 hours) 1. Introduction to the construction industry <ul style="list-style-type: none"> a. Review historical trends b. Discuss environmental regulations c. Discuss career opportunities 2. Safety Unit <ul style="list-style-type: none"> a. Review safety rules and policies b. Review emergency guidelines c. Demonstrate safe handling of equipment and tools d. Identify and select tools for specific jobs e. Know procedures for cleaning and care for tools and equipment f. Demonstrate proficiency in the safe use of hand tools and power tools g. Demonstrate proper use of Personal Protective Equipment (PPE) h. Understand the health factors involved in the materials used in construction i. Understand importance of information on Material Safety Data Sheets (MSDS) j. Describe procedures for safe handling of hazardous materials k. Describe clothing safety as it applies to carpenters l. List safety measures relating to shoring and scaffolding m. Describe proper methods of lifting and carrying to avoid injury 	Anchor Standards (integrated throughout course) 2.1 Recognize the elements of communication using a sender–receiver model. 2.2 Identify barriers to accurate and appropriate communication. 2.3 Interpret verbal and nonverbal communications and respond appropriately. 2.4 Demonstrate elements of written and electronic communication such as accurate spelling, grammar, and format. 2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats. 3.1 Identify personal interests, aptitudes, information, and skills necessary for informed career decision making. 3.2 Evaluate personal character traits such as trust, respect, and responsibility and understand the impact they can have on career success. 3.3 Explore how information and communication technologies are used in career planning and decision making. 3.4 Research the scope of career opportunities available and the requirements for education, training, certification, and licensure. 3.5 Integrate changing employment trends, societal needs, and economic conditions into career planning. 3.6 Recognize the role and function of professional organizations, industry associations, and organized labor in a productive society. 4.1 Use electronic reference materials to gather information and produce products and services. 5.1 Identify and ask significant questions that clarify various points of view to solve problems. 5.2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate. 5.3 Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment. 5.4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions. 6.0 Health and Safety Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols,	Lecture and demonstration. PowerPoint presentation of safety material. Students demonstrate safe and proper handling of tools and equipment. Students practice putting on PPE (Personal Protective Equipment), and discuss the types of protection required when using different tools. Class discussion. Quiz. View Safety Videos Students develop safety guidelines for use in class

	<p>key terms, and domain-specific words and phrases as related to the Building and Construction Trades sector workplace environment. (Direct alignment with RSTS 9-10, 11-12.4)</p> <p>6.1 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities.</p> <p>6.2 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies.</p> <p>6.3 Set up a work area, or shop, to avoid potential health concerns and safety hazards, including but not limited to electrical (shock), wires (tripping), fumes (lung health), noise (hearing loss), fire (burns), and so forth, incorporating ergonomics.</p> <p>6.4 Practice personal safety when lifting, bending, or moving equipment and supplies.</p> <p>6.5 Demonstrate how to prevent and respond to work-related accidents or injuries; this includes demonstrating an understanding of ergonomics.</p> <p>6.6 Maintain a safe and healthful working environment.</p> <p>6.7 Be informed of laws/acts pertaining to the Occupational Safety and Health Administration (OSHA).</p> <p>6.8 Report hazards found on the job site to supervisor/teacher.</p> <p>6.9 Locate, and adhere to, Material Safety Data Sheet (MSDS) instructions.</p> <p>6.10 Maintain proper use of safety apparel at all times, including but not limited to, eye protection, hearing protection, skin protection, head protection, footwear and protection from airborne particulate matter.</p> <p>6.11 Comply with the safe handling, storage and disposal of chemicals, materials and adhesives in accordance with local, state, and federal safety and environmental regulations (OSHA, Environmental Protection Agency [EPA], Hazard Communication [HazCom], Material Safety Data Sheets [MSDS], etc.).</p> <p>6.12 Demonstrate the proper care and safe use of hand, portable and stationary power tools.</p> <p>7.2 Explain the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.</p> <p>7.3 Understand the need to adapt to changing and varied roles and responsibilities.</p> <p>7.4 Practice time management and efficiency to fulfill responsibilities.</p> <p>7.5 Apply high-quality techniques to product or presentation</p>	
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	<p>design and development.</p> <p>7.6 Demonstrate knowledge and practice of responsible financial management.</p> <p>7.7 Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession.</p> <p>7.8 Explore issues of global significance and document the impact on the Building and Construction Trades sector.</p> <p>8.1 Access, analyze, and implement quality assurance standards of practice.</p> <p>8.4 Explain the importance of personal integrity, confidentiality, and ethical behavior in the workplace.</p> <p>8.5 Analyze organizational culture and practices within the workplace environment.</p> <p>9.0 Leadership and Teamwork</p> <p>Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution as practiced in the SkillsUSA career technical student organization. (Direct alignment with SLS 11-12.1b)</p> <p>9.1 Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.</p> <p>9.2 Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills as applied in groups, teams, and career technical student organization activities.</p> <p>9.3 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting.</p> <p>9.4 Explain how professional associations and organizations and associated leadership development and competitive career development activities enhance academic preparation, promote career choices, and contribute to employment opportunities.</p> <p>9.5 Understand that the modern world is an international community and requires an expanded global view.</p> <p>9.6 Respect individual and cultural differences and recognize the importance of diversity in the workplace.</p> <p>9.7 Participate in interactive teamwork to solve real Building and Construction Trades sector issues and problems.</p> <p>10.0 Technical Knowledge and Skills</p> <p>Apply essential technical knowledge and skills common to all</p>	
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	<p>pathways in the Building and Construction Trades sector, following procedures when carrying out experiments or performing technical tasks. (Direct alignment with WS 11-12.6)</p> <p>10.1 Interpret and explain terminology and practices specific to the Building and Construction Trades sector.</p> <p>10.2 Comply with the rules, regulations, and expectations of all aspects of the Building and Construction Trades sector.</p> <p>11.1 Utilize work-based/workplace learning experiences to demonstrate and expand upon knowledge and skills gained during classroom instruction and laboratory practices specific to the Building and Construction Trades sector program of study.</p> <p>11.2 Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and/or continued learning at the postsecondary level.</p> <p>Pathway Standards</p> <p>D1.1 Understand significant historical trends in the construction industry.</p>	
<p>B. Academic standards and soft skills needed for success in the construction industry (10-20 hrs)</p> <p>1. Understand the importance of communication, problem solving, and critical thinking skills, realizing these concepts will be emphasized throughout the curriculum</p> <ol style="list-style-type: none"> Discuss the importance of being able to communicate clearly with one's boss, co-workers, and clients Read texts, journals, and on-line materials as required for classroom studies Write short reports on different aspects of the construction industry Discuss problem solving and critical thinking skills that will be used throughout the course 	<p>Pathway Standards</p> <p>D2.1 Apply formulas to determine area, volume, lineal, board, and square feet.</p> <p>D2.2 Apply the Pythagorean Theorem to calculate pipe offsets, roof slope, and check for square.</p> <p>D2.3 Estimate the materials needed to complete a specific task.</p>	<p>Read the product information and other consumer documents (warranties, instruction manuals, safety warnings, etc.) on hand tools and power tools used in class.</p> <p>Write a "manual" describing the tools used in construction and how they are used.</p> <p>Research and write a report about the various careers in the construction industry.</p> <p>Participate in class discussion, role playing, communication activities, impromptu speech activities, and active listening</p>
<p>1. Discuss issues of responsibility and flexibility on the job site, demonstrating these qualities during classroom projects</p>		<p>Class discussion of responsibility and teamwork (see issues listed in the course outline and standards to the left).</p>

<p>2. Discuss leadership and teamwork, demonstrating these qualities on group projects</p> <p>3. Practice construction math skills</p> <ol style="list-style-type: none"> Work with measurements and fractions Practice converting decimals to fractions Calculate area Estimate amount of wood needed to build a certain project Estimate materials needed to build a certain project Estimate cost to build a certain project Practice making the following angles: acute, right, obtuse, straight Solve basic math problems related to carpentry Solve problems using board, linear, foot, square-foot, and cubic-foot measurements Measure horizontal and vertical surfaces, using millimeters, centimeters, and feet plus inches 		<p>Working in groups, students research origins and development of carpentry tools, including basic physics, historical applications, current use, and safety. Report to the class in the form of posters, demonstrations, models, or multimedia.</p> <p>Compare and contrast the English measuring system and the International system of Units (SI/metric system). Discuss similarities and differences in the measurements and where they originated. Illustrate examples of conversions between the systems using perimeter and area measurements. Discuss which system is more useful in the construction field.</p> <p>Use and become familiar with a standard rules divided into 1/16ths. Measure the length of various objects and put the fractional measurements in order from least to greatest.</p> <p>Use mathematical formulas to determine specific area, volume, and perimeter measurements determined by reading the blueprints of a building. Convert measurements from scale units to actual units. Calculate in both fractions and decimals. Produce answers in both English and SI systems of units. Solve a daily math problem based on construction scenario. Create pre-project report that includes materials, sketch, etc.</p>
<p>C. Preparing to construct a building (25-50 hours)</p> <p>1. Building materials</p> <ol style="list-style-type: none"> Describe hardwood and softwood classifications Define moisture content Identify common defects in lumber 	<p>Pathway Standards</p> <p>D2.3 Estimate the materials needed to complete a specific task.</p> <p>D3.0 Interpret and apply information from technical drawings, schedules, and specifications used in the construction trades.</p> <p>D3.1 Identify the elements used in technical drawings, including types of lines, symbols, details, and views.</p>	<p>Research and analyze the various types of building materials. Explain the pros and cons of using one type over another, including environmental impact. Make an oral report to the class.</p>

<ul style="list-style-type: none"> d. Define lumber grading terms e. Calculate lumber sizes according to established industry standards f. Identify nail types and sizing units g. List precautions to observe while working with treated lumber h. Identify a variety of metal framing connectors and indicate where each is used i. "Green" building materials 	<p>D3.2 Identify and interpret the elements of technical drawings, including plan, elevation, section, and detail views.</p> <p>D3.4 Identify plumbing, electrical, and mechanical symbols and other abbreviations used in construction drawings.</p> <p>D3.5 Interpret and scale dimensions from a set of plans using an architect's scale.</p> <p>D3.6 Interpret sectional and detail drawings to determine construction details such as corners, rough openings, stairs, and roof systems.</p> <p>D3.7 Understand the sequencing and phases of residential and commercial construction projects.</p> <p>D4.1 Use leveling devices to check for elevation, level, and plumb.</p> <p>D4.2 Demonstrate how to establish grades using survey instruments.</p> <p>D4.4 Check site layout for square using the diagonal method.</p>	<p>Demonstration and class discussion.</p> <p>Discuss "green" construction techniques and building materials.</p> <p>Build a project using green construction techniques.</p>
<p>2. Hand tools</p> <ul style="list-style-type: none"> a. Identify the most common hand tools b. Select the proper hand tool for a given job c. Explain proper methods of tool maintenance and storage d. Demonstrate safe handling of the following tools: <ul style="list-style-type: none"> • Measuring and layout tools • Saws and blades • Planing, smoothing, and shaping tools • Drilling and boring tools • Fastening tools • Prying tools • Gripping and clamping tools 		<p>List tools needed for a particular project and calculate the cost of those tools, including sales tax.</p> <p>Select a hand tool from those needed to build a home and describe its purpose, how it works, and why you would use that tool over its next best alternative.</p> <p>Demonstration and practice.</p>
<p>3. Power tools</p> <ul style="list-style-type: none"> a. Recognize common power tools b. Explain the function and operation of the principal power tools c. Identify the parts of common power tools d. Demonstrate safe handling of the power tools listed to the right (in the Standards column) 		<p>Select a power tool from those needed to build a home and describe its purpose, how it works, and why you would use that tool over its next best alternative.</p> <p>Demonstration and practice.</p>

<p>4. Plans, specifications, and codes</p> <ul style="list-style-type: none"> a. Identify the elements commonly included in a set of house plans b. Demonstrate the use of scale in architectural drawings c. Identify architectural symbols d. Read and understand a set of blueprints e. Explain the use of building specifications f. Summarize the concept of modular construction g. Describe the application of building codes, standards, and permits h. Discuss designs for "green" buildings 		<p>Design a construction project, such as a backyard storage shed, from beginning to end. Include plans, required building materials, cost estimates, schedules, city ordinances, etc. Upon completion of the project, analyze the plans, schedules, and cost estimates for error; determine why the errors were made and how to correct them. Present the project and findings to the class.</p> <p>Demonstrate the activities regarding plans and project management listed in the course outline and standards to the left.</p> <p>Use recycled wood to build shed.</p>
<p>5. Building layout</p> <ul style="list-style-type: none"> a. Explain the operation of the builder's level and level-transit b. Explain the basic operation of a laser level system c. Demonstrate proper setup, sighting, and leveling procedures d. Measure and lay out angles using leveling equipment e. Read the vernier scale f. Use a plumb line 		<p>Demonstrate the activities regarding building layout and measurement listed in the course outline and standards to the left.</p>
<p>D. Foundations and Framing (50-100 hours)</p> <p>1. Footings and foundations</p> <ul style="list-style-type: none"> a. Lay out building lines and set up batter boards b. Describe excavation procedures c. Explain footing requirements and how to build footing forms d. Describe the building, erecting, and use of forms 	<p>Pathway Standards</p> <p>D2.1 Apply formulas to determine area, volume, lineal, board, and square feet.</p> <p>D2.2 Apply the Pythagorean Theorem to calculate pipe offsets, roof slope, and check for square.</p> <p>D2.3 Estimate the materials needed to complete a specific task.</p> <p>D3.1 Identify the elements used in technical drawings, including types of lines, symbols, details, and views.</p>	<p>Build a shed, or similar project, using all appropriate steps and techniques listed in the course outline and standards.</p> <p>Design and construct a floor frame. Calculate the allowable span of floor beams depending on the size and wood species of the beam. Calculate the number of studs needed. Determine the</p>

<p>for poured foundation walls</p> <ul style="list-style-type: none"> e. Discuss the types of foundation systems used for residential buildings f. Explain foundation insulating and waterproofing procedures g. Estimate concrete materials required for a specific area <p>2. Floor framing</p> <ul style="list-style-type: none"> a. Identify the main parts of a platform frame b. Calculate the load on girders and beams used in residential construction c. Lay out and install sills on a foundation wall d. Describe how layouts are made on a header joist e. Explain the correct procedure to follow when assembling a floor frame f. Identify the parts of a floor truss g. Prepare a sketch that shows how overhangs and projections are framed h. Describe materials used for subflooring i. Estimate materials (sizes and amounts) required to construct a specific floor frame <p>3. Wall and ceiling framing</p> <ul style="list-style-type: none"> a. Identify the main parts of a wall frame b. Show how rough openings are handled in wall construction c. Explain plate and stud layout d. Describe the construction and erection of wall sections and partitions e. List the materials commonly used for sheathing f. Demonstrate the process of ceiling frame construction g. Estimate materials required for wall frames, ceiling frames, and sheathing <p>4. Roof framing</p> <ul style="list-style-type: none"> a. List and describe the various types of roofs 	<p>D3.2 Identify and interpret the elements of technical drawings, including plan, elevation, section, and detail views.</p> <p>D3.3 Interpret technical drawings specifications.</p> <p>D3.4 Identify plumbing, electrical, and mechanical symbols and other abbreviations used in construction drawings.</p> <p>D3.5 Interpret and scale dimensions from a set of plans using an architect's scale.</p> <p>D3.6 Interpret sectional and detail drawings to determine construction details such as corners, rough openings, stairs, and roof systems.</p> <p>D3.7 Understand the sequencing and phases of residential and commercial construction projects.</p> <p>D4.1 Use leveling devices to check for elevation, level, and plumb.</p> <p>D4.4 Check site layout for square using the diagonal method.</p> <p>D5.1 Describe the sequencing procedures for placing large and small slabs.</p> <p>D5.2 Demonstrate how to establish elevations for concrete structures.</p> <p>D5.3 Lay out location and elevation of concrete/masonry structures based on construction drawings.</p> <p>D5.4 Develop a material take-off in accordance with construction drawings and specifications.</p> <p>D5.5 Lay out location for reinforcements, expansion joints, openings, and embedded items based on construction drawings, specifications, and building codes.</p> <p>D6.0 Demonstrate carpentry techniques for the construction of a single-family residence.</p> <p>D6.2 Attach a sill plate at top of concrete foundation.</p> <p>D6.3 Lay out, cut, and installs joist supports, rim joists, and floor joists as specified on construction plans.</p> <p>D6.4 Install a subfloor.</p> <p>D6.5 Demonstrate wall and plate layout, including rough openings.</p> <p>D6.6 Measure, cut, and assemble wall components using appropriate tools and fasteners.</p> <p>D6.7 Demonstrate the ability to square wall systems and install wall bracing and shear panels according to code.</p> <p>D6.8 Stand, square, plumb, and brace walls.</p> <p>D6.10 Lay out, cut, and installs ceiling joists and common and jack rafters.</p>	<p>proper measurements and location of notches on joists and studs. Ascertain the size of nail needed. Calculate the allowable plywood sub-floor span. Create an estimate of materials and costs to complete the project. Prepare a bill materials estimate, including sales tax.</p> <p>Work on class project, demonstrating techniques listed in course outline to the left.</p> <p>Other projects: build a full wall section, a full-size roof frame, a 2' x 2' model house.</p> <p>Using exact measurements create a roof frame plan for a construction project. Draw plans to scale using a compass and straightedge. Calculate the allowable span of ceiling and roof beams depending on the size and species of wood. Calculate the</p>
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<ul style="list-style-type: none"> b. Identify the parts of a common rafter c. Define the terms slope and pitch d. Demonstrate use of framing square, speed square and rafter tables e. Lay out common rafters f. Describe the layout and erection of a gable roof g. Explain the design and erection of trusses <p>5. Framing with steel</p> <ul style="list-style-type: none"> a. List advantages/disadvantages of steel framing b. Describe the fastening methods used with steel framing components c. Explain how wood and steel structural components are combined in floor framing d. Demonstrate construction of walls using metal studs e. Explain the use of a jig for fabricating steel roof trusses on the job site f. Describe safety precautions that must be used when working with steel framing components 	<p>D6.11 Frame and erect shed and gable roof systems.</p> <p>D6.12 Lay out and install trusses "on-center" with specified hardware.</p> <p>D6.13 Install appropriate blocking, bracing, lookouts, fascia, and drip edge.</p> <p>D6.14 Frame for roof penetrations and attic access.</p> <p>D6.15 Apply roof sheathing and install appropriate flashings.</p>	<p>allowable load for plywood roof sheathing. Calculate the allowable span for roof rafters using visual graded lumber. Determine the proper measurements and location of notches on joists and studs. Ascertain the size of nail needed depending on the connection materials. Find the perimeter, surface area and volume of frame pieces to assure accuracy in plan measurements.</p> <p>Estimate materials for roof framing in board feet required and nails needed. Prepare a report explaining the importance of understanding rise over run (slope) when designing a roof, including examples and diagrams.</p> <p>Design and build scale models of structures such as sheds or homes</p>
<p>E. Closing In and Finishing (50-100 hours)</p> <p>1. Roofing materials and methods</p> <ul style="list-style-type: none"> a. Define roofing terms, such as slope and pitch b. List the covering materials commonly used for sloping roofs c. Describe how to prepare the roof deck d. Describe re-roofing procedures for both asphalt and wood shingles e. Demonstrate correct nailing patterns f. Demonstrate the proper positioning of gutters g. Estimate materials needed for a roofing job <p>2. Windows and exterior doors</p> <ul style="list-style-type: none"> a. Discuss standards for window and door 	<p>Pathway Standards</p> <p>D1.1 Understand significant historical trends in the construction industry.</p> <p>D1.2 Understand the environmental regulations that influence residential and commercial design.</p> <p>D1.3 Demonstrate knowledge of the California Environmental Quality Act (CEQA) and Environmental Impact Review (EIRs) impacts on residential and commercial construction.</p> <p>D3.1 Identify the elements used in technical drawings, including types of lines, symbols, details, and views.</p> <p>D3.2 Identify and interpret the elements of technical drawings, including plan, elevation, section, and detail views.</p> <p>D3.3 Interpret technical drawings specifications.</p>	<p>Work on class project, demonstrating techniques listed in course outline to the left.</p>

<p>fabrication</p> <ul style="list-style-type: none"> b. Calculate required rough openings c. Interpret a window schedule d. Explain how window frames are adjusted for wall thickness e. Summarize procedures for installing a window f. Prepare a rough opening for installation of a door frame <p>3. Exterior wall finish</p> <ul style="list-style-type: none"> a. Describe cornice and rake construction b. Illustrate approved methods of flashing installation c. Describe how wood siding and shingles are applied d. Estimate the amount of siding or shingles required for a specific structure e. List the most common siding choices and their characteristics <p>4. Thermal and sound insulation</p> <ul style="list-style-type: none"> a. Summarize the principles of conduction, convection, and radiation b. Interpret thermal ratings charts c. Describe the types of insulation d. Select appropriate areas for insulation in a given structure e. Explain the principle of condensation f. Describe methods of controlling moisture g. List general procedures for installing batt and blanket, fill, and rigid insulation <p>5. Interior wall and ceiling finish</p> <ul style="list-style-type: none"> a. Explain wall and ceiling covering materials b. Describe the characteristics of gypsum plaster c. Explain how gypsum and metal lath are applied d. Describe plastering methods e. Describe methods for leveling and installing a 	<p>D3.4 Identify plumbing, electrical, and mechanical symbols and other abbreviations used in construction drawings.</p> <p>D3.5 Interpret and scale dimensions from a set of plans using an architect's scale.</p> <p>D3.6 Interpret sectional and detail drawings to determine construction details such as corners, rough openings, stairs, and roof systems.</p> <p>D3.7 Understand the sequencing and phases of residential and commercial construction projects.</p> <p>D6.15 Apply roof sheathing and install appropriate flashings.</p> <p>D6.16 Understand different roofing materials and methods of application.</p> <p>D7.0 Demonstrate proper installation techniques of interior finish materials and protective finishes.</p> <p>D7.1 Identify types and uses of wall finishing materials.</p> <p>D7.2 Cut, fit, and install gypsum wallboard onto a framed wall using appropriate fasteners.</p> <p>D7.3 Describe the finishes and textures for gypsum wallboard.</p> <p>D7.4 Properly prepare walls to receive protective finishes.</p> <p>D7.5 Apply finishes according to specifications and industry standards.</p> <p>D7.6 Identify types and application of finish flooring materials.</p> <p>D7.7 Install pre-hung interior doors.</p> <p>D7.8 Install interior trim and case work.</p> <p>D8.3 Install wood, vinyl, and/or manufactured siding.</p> <p>D8.4 Demonstrate preparation techniques for applying exterior paint and stain.</p> <p>D8.5 Apply exterior paint and stain according to specifications.</p> <p>D8.6 Describe various types and uses of doors and windows used in building construction.</p> <p>D8.7 Install pre-hung windows and doors using appropriate flashing and trim.</p> <p>D8.8 Caulk and seal joints to prevent air and moisture infiltration and increase energy efficiency.</p>	<p>Work on class project, demonstrating techniques listed in course outline to the left.</p> <p>Sheetrock a wall and a partition; patch and repair; paint the wall.</p>
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<p>suspended ceiling</p> <p>f. Estimate quantities of lath, wallboard, and ceiling tiles for a specific interior</p> <p>6. Finish flooring</p> <p>a. Describe strip, plank, and unit block wood flooring</p> <p>b. Lay out and install strip flooring on concrete or plywood subfloors</p> <p>c. Describe the procedure for applying hardboard, particleboard, waferboard, and plywood underlayment</p> <p>d. Outline basic steps for installing resilient flooring</p> <p>7. Stair construction</p> <p>a. Identify the various types of stairs</p> <p>b. Calculate the rise-run ratio, number and size of risers, and stairwell length</p> <p>c. Lay out stringers for a given stair rise and run</p> <p>8. Doors and interior trim</p> <p>a. Describe how door frames and casings are installed</p> <p>b. Explain the difference between panel and flush-type doors</p> <p>c. List the steps for hanging a door</p> <p>9. Painting and finishing</p> <p>a. Cite safety rules that apply to painting and finishing</p> <p>b. List tools and equipment used in painting and demonstrate their use</p> <p>c. Prepare exterior and interior surfaces for painting</p>		
<p>F. Mechanical Systems (25-50 hours)</p> <p>1. Electrical wiring</p> <p>a. Define basic electrical terms</p> <p>b. Explain what is included in an electrical wiring system</p> <p>c. List the tools, devices, and materials required to do electrical wiring in a residential building</p>	<p>Pathway Standards</p> <p>D2.3 Estimate the materials needed to complete a specific task.</p> <p>D3.1 Identify the elements used in technical drawings, including types of lines, symbols, details, and views.</p> <p>D3.2 Identify and interpret the elements of technical drawings, including plan, elevation, section, and detail views.</p> <p>D3.3 Interpret technical drawings specifications.</p>	<p>Build mock-ups for wiring system, including wiring outlets and lights.</p> <p>Build mock-up for plumbing system; weld or solder copper tubing and plastic ABS tubing.</p> <p>Discuss HVAC functions and design.</p>

<ul style="list-style-type: none"> d. Demonstrate understanding of basic circuit theory e. Use approved methods for simple wiring installation tasks f. Perform simple electrical troubleshooting <p>2. Plumbing systems</p> <ul style="list-style-type: none"> a. Cite codes that govern the installation of plumbing systems b. List necessary plumbing tools and explain how to use them c. Describe the different types of materials used in plumbing systems d. Explain the proper design and installation of plumbing system e. Read plumbing prints f. Cite safety measures that plumbers must observe <p>3. Heating, Ventilation, and Air Conditioning</p> <ul style="list-style-type: none"> a. Identify ways to conserve energy in housing b. Describe the functions of the HVAC system 	<p>D3.4 Identify plumbing, electrical, and mechanical symbols and other abbreviations used in construction drawings.</p> <p>D3.5 Interpret and scale dimensions from a set of plans using an architect's scale.</p> <p>D3.7 Understand the sequencing and phases of residential and commercial construction projects.</p> <p>D10.1 Demonstrate techniques for cutting, deburring, and joining metallic and nonmetallic water piping.</p> <p>D10.3 Perform pressure test of an installed piping system.</p> <p>D10.12 Check for the proper functioning of fixtures.</p> <p>D11.1 Determine whether or not an electrical circuit is "live."</p> <p>D11.2 Prepare rough framing for the installation of electrical cables and conduit.</p> <p>D11.4 Install typical devices, junction boxes, and panels.</p> <p>D11.7 Splice and tap conductors for the installation of fixtures and devices.</p> <p>D11.9 Demonstrate grounding techniques for all electrical boxes, cabinets, and enclosures.</p> <p>D11.10 Terminate electrical connections to receptacles, switches, lighting fixtures, large appliances, and other devices.</p> <p>D11.11 Select receptacles and switches based on load requirements.</p> <p>D11.12 Terminate equipment grounding and neutral conductor at the electrical service.</p>	
<p>G. Career pathways (10-20 hours)</p> <ul style="list-style-type: none"> 1. Research and discuss career pathways in the construction industry, including carpentry, plumbing, plastering, masonry, electrical, and welding 2. Discuss postsecondary training needed to advance in the construction field 3. Research and discuss apprenticeship programs and union requirements 4. Properly fill out a job application 5. Write a resume and cover letter 6. Compile a portfolio 7. Practice interviewing techniques 		<p>Research and prepare a report on the various careers in the construction industry. Include information on education and/or experience required, salaries, benefits, and opportunities for training and advancement.</p> <p>Guest speakers from the construction industry share their experience with the class.</p> <p>Fill out a job application; write a resume, cover letter, and thank-you letter.</p> <p>Practice interviewing techniques.</p> <p>Class discussion.</p>

<p>8. Discuss workplace standards, ethics, and legal responsibilities</p> <p>9. Discuss issues involved in keeping a job</p>		<p>Field trips to trade unions, training centers and job sites</p>
<p>10. Review the technical knowledge and skills standards listed to the right, and discuss how they contribute to success in the construction industry</p>		<p>Review and class discussion.</p>

<p>TOTAL HOURS: 180 – 360 Optional Internship: <u>180</u> TOTAL MAXIMUM HOURS: 540</p> <p><i>Note: Typical high school class equals 180 hours per year</i></p>	
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IV. METHODS, STRATEGIES AND TECHNIQUES

A variety of strategies and techniques are used to instruct the students, including:

- Direct instruction (demonstrations, lecture, small and large group discussion, selected readings)
- Project-based learning
- Embedded assessments
- Collaborative learning opportunities
- Use of community resources including guest speakers, mentors, and field trips
- Student presentations
- Peer coaching and student mentoring
- Hands-on experience
- Group and individual projects

V. ASSESSMENT OF STUDENT PERFORMANCE

Assessment of student performance includes but is not limited to:

- Work ethics, punctuality and attendance
- Classroom participation and effort
- Mastery of skills and quality of work
- Group and individual projects
- Written and practical skills testing
- Industry-related tests
- Notebook
- Completion of required assignments/portfolio, including:
 - Build a full wall section, a full-size roof frame, a 2' x 2' model house, or a storage shed
 - Read plans and draw plans for classroom or off-site projects

- Frame the 2' x 2' house and the full wall section
- Sheet rock a wall and a partition, patch and repair; paint the wall
- Build mock-up for wiring system, including wiring outlets and lights
- Build mock-up for plumbing system, including soldering and welding copper and plastic tubing

VI. BTA/CTE CERTIFICATE REQUIREMENTS

To earn ROP certification for this course, the student must accomplish the following:

- Complete student performance objectives
- Maintain a 95% attendance rate
- Demonstrate a positive work attitude

VII. ASSESSED JOB MARKET NEEDS

According to ONET, the on-line Occupational Information Network, the field of carpenters is expected to grow faster than average compared with the total for all occupations. Jobs for Carpenters are expected to increase by 17 percent or 40,830 jobs between 2010 and 2020. The median wage for carpenters in California is \$53,600 annually.

VIII. DEPARTMENTALLY APPROVED INSTRUCTIONAL MATERIALS AND EQUIPMENT

Texts and Resources

Modern Carpentry, 11th edition, by Willis Wagner and Howard Smith, Goodheart-Willcox Co., 2008

The Very Efficient Carpenter: Basic Framing for Residential Construction, Larry Haun, Taunton Press

Tools for Success: Soft Skills for the Construction Industry, National Center for Construction Education and Research, 2004

Handouts on “green” construction techniques

Instructional Videos

“How to” clinic series on different aspects of residential construction

Safety videos

Carpentry and construction techniques

Tools and equipment operation

Safety Web site: www.citea.org/mtta

Equipment and Power Tools:

Band saw, saber saw, compound saw, table saw, radial arm saw, cut-off saw, reciprocating saw, jig saw

Planer, router, drill press, miter, portable drill, jointer

Roto hammer, belt sander, finishing sanders