CareerClusters™ PATHWAYS TO COLLEGE & CAREER READINESS
Architecture & Construction

Learning that works for Colorado CTE®

Colorado CTE Course – Scope and Sequence

Course Name	Construction Maintenance Technology	Course Details	Course Credit: 2.0 Prerequisites: None
		350 Periods 15,750 Minutes 262.5 Hours*	
Course Description	This course is designed to teach students skills in repair and maintenance as it relates to the construction trade. Areas of training emphasis will be in electrical maintenance, small engine maintenance, basic welding and basic metal working as it applies to the construction trade leading to a maintenance career. Students will use basic hand tools and machines of the construction trade to perform repair of machines, mechanical equipment, and building maintenance. This course would allow completers to perform routine preventive maintenance and ensure that machines continue to run smoothly, building systems operate efficiently, and the physical condition of buildings are maintained. No prerequisite.		
Note:	This is a suggested scope and sequence for the course content. The content will work with any textbook or instructional resource. If locally adapted, make sure all essential knowledge and skills are covered.		
SCED Identification #	17009	*Schedule calculation based on 60 calendar days of a 90-day semester. Scope and sequence allows for additional time for guest speakers, student presentations, field trips, remediation, or other content topics.	

All courses taught in an approved CTE program must include Essential Skills embedded into the course content. The Essential Skills Framework for this course can be found at **https://www.cde.state.co.us/standardsandinstruction/essentialskills**

Instructional Unit Topic	Suggested Length of Instruction	CTE or Academic Standard Alignment	Competency / Performance Indicator	Outcome / Measurement	CTSO Integration
Industry and Employment		Understand the nature and scope of the Architecture &Construction Career Cluster and the role architecture and construction play in society and the economy.	The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to: (A) express ideas and messages to others in a clear, concise, and effective manner, including explaining or conveying written information in a professional comprehensive manner; (B) compile data using numbers in various formats	Research and match career opportunities based upon their fit with personal career goals. • Locate and interpret career information for at least one career pathway within the cluster. • Identify job requirements for the career cluster/pathway.	

			to solve job-appropriate problems; (C) demonstrate how to choose the ethical course of action and comply with all applicable rules, laws, and regulations; (D) demonstrate punctuality, dependability, reliability, and responsibility consistently in reporting for duty and performing assigned tasks as directed; and (E) evaluate systems and operations; identify causes, problems, patterns, or issues; and explore workable solutions or remedies to improve situations.	• Identify educational and credentialing requirements for careers within the cluster. • Develop a personal career plan for advancement in the architecture and construction career pathway. • Successfully simulate the contracting process to include contract development, the bid process, payment terms, planning approvals and limitations of liability.	
Safety & Health Standards		Comply with regulations and applicable codes to establish and manage a legal and safe workplace/jobsite. Demonstrate appropriate health and safety practices based on the specific occupational area.	The student demonstrates knowledge of basic worksite safety regulations and safety guidelines such as in electrical work and carpentry. The student is expected to: (A) demonstrate safe working procedures during building maintenance and repair; (B) explain the purpose of the Occupational Safety and Health Administration (OSHA)	Read and discuss information on OSHA, EPA and other safety regulations. Complete OSHA training and receive certification. Pass safety inspections and comply with regulations at all times.	

			and how to promote safety on a worksite; (C) identify worksite hazards and how to avoid or minimize them on a worksite; (D) explain safety obligations of workers, supervisors, and managers to ensure a safe worksite; (E) discuss the causes, effects, impacts, and costs of accidents; (F) define safe work procedures for working with hazardous chemicals; (G) define proper use of personal protective equipment; and (H) identify potential construction hazards, including hazardous material exposures, welding, cutting hazards, and confined spaces.	Follow safe practices relating to environmental hazards. Identify workplace hazards common to design and construction situations. Follow governmental regulations and building codes. Follow industry regulations and building codes. Follow jurisdictional regulations and building codes. Use information given in regulations and codes correctly. Pass job inspections and comply with regulations at all times. Pass required substance abuse screening.	
Tools and Measurement		Apply construction skills when repairing, restoring, or renovating existing structures. Demonstrate tool and equipment operation	The student demonstrates how to use hand tools that are commonly used in the worksite such as hammers, saws, levels, pullers, and clamps. The student is expected to:	Students will identify and be able to demonstrate the operation of construction tools and equipment to include, but not limited to, hammers, saws, levels, puller,	

		according to current industry and OSHA standards. Identify and demonstrate techniques in the use of hand tools. Identify and demonstrate techniques in the use of power tools. Identify and demonstrate the use of layout and measuring devices, including laser levels.	(A) explain and demonstrate the specific applications and uses of hand tools; and (B) identify the important safety and maintenance requirements for hand tools. The student demonstrates how to use power tools that are commonly used in the worksite such as drills, grinders, saws, and sanders. The student is expected to: (A) explain and demonstrate appropriately the specific applications and uses of power tools; and (B) identify the important safety and maintenance requirements for power tools.	clamps, drills, grinders, sanders, etc. Students will identify specific regulations and maintenance requirements for construction related equipment and tools.	
Maintenance Schedules		Plan and practice preventative maintenance activities to service existing structures. Maintain and inspect building systems to achieve safe and efficient operation of facilities.	The student understands aspects of scheduled maintenance, including inspections, adjustments, regular service and planned shutdowns. The Student will be able to: (A) Identify the components of a maintenance plan and associated schedules; (B) state the importance of regularly identified maintenance; and (C) identify and perform basic preventative maintenance for the following:	Demonstrate building maintenance skills: • Perform maintenance on an air filter system including checking oil and belts and replacing filters. • Demonstrate basic procedures to troubleshoot common problems in heating and cooling systems.	

			I. Furnace II. Thermostat III. Filters IV. Blower belts and/or bearings	• Define and demonstrate how to clean and maintain heating and air conditioning systems according to current industry standards. Explain the importance of scheduled maintenance.	
Blueprints		Read, interpret and use technical drawings, documents and specifications to plan a project.	The student interprets various types of working drawings as they pertain to commercial construction and becomes familiar with all aspects of commercial construction documents, including architectural, engineering, and shop drawings. The student is expected to: (A) describe the types of drawings usually included in a set of plans and list the information found on each type; (B) identify the different types of lines used on blueprint drawings; (C) identify selected electrical, mechanical, and plumbing symbols commonly used on plans;	Recognize elements and symbols of blueprints and drawings. Use specifications and standards. Apply specifications and standards appropriately. Sketch/draw/illustrate concepts and ideas. Draw or sketch plan/layout to be completed. Use proper measurements to determine layout. Interpret and explain standards and specifications.	

			(D) identify selected architectural symbols commonly used to present materials on plans; (E) identify selected abbreviations commonly used on plans; (F) read and interpret plans, elevations, schedules, sections, and details contained in basic construction drawings; (G) describe the purpose of written specifications; and (H) identify and describe the parts of a specification.		
Lubricants & Fasteners for basic mechanical maintenance		Determine work required to repair or renovate an existing building or structure. Identify fasteners and describe their use (e.g., screws, nails, bolts, nuts, washers, clamps, anchors and clips).	Student performs basic mechanical maintenance tasks associated with maintaining apartment and commercial properties. The student is expected to: (A) define lubrication and describe the four forms of lubricants; (B) discuss the characteristics of static, kinetic, fluid, and rolling friction; (C) Explain how a lubricant reduces wear and dampens shock; (D) discuss the cooling action of lubricants and explain how they prevent corrosion; (E) explain the importance of a lubricant's sealing action, and explain how it works;		

			(F) identify seven major types of threaded fasteners; (G) read and interpret common screw thread and threaded fastener specifications; (H) describe the three actions in a manual riveting operation, and explain why each action must be done properly; (I) demonstrate the proper technique for safety wiring a group of threaded fasteners; and (J) Identify three kinds of washers and their applications.		
Wall Repair, Trim and Finish Work		Identify types of wood used for building and repair projects (e.g., plywood, dimensional lumber, treated lumber, flooring and specialty woods) Describe the uses of brick, masonry, steel, plaster and glass for building and repair projects.	The student knows various types of gypsum drywall and their uses and the fastening devices and methods used to install them. The student is expected to: (A) identify the different types of drywall and their uses; (B) select the type and thickness of drywall required for specific installations; (C) explain the fastener schedules for different types of drywall installations; (D) perform single-layer and multi-layer drywall installations using different types of fastening systems,	Demonstrate preparation and application skills for painting and finishing projects. Define the chemical properties of paints, stains and finishes. Identify tools and equipment specific to painting and finishing projects. Prepare surfaces (i.e., walls, ceilings, wood, masonry and metal) for the application of paint and other finishes.	

			including nails, drywall screws, and adhesives; (E) install gypsum drywall on steel studs; and (F) estimate material quantities for a drywall installation The student knows the materials, tools, and methods used to finish and patch gypsum drywall. The student is expected to: (A) describe the differences among the six levels of finish established by industry standards and distinguish a finish level by observation; (B) identify the hand tools used in drywall finishing and demonstrate the ability to use these tools; (C) identify the automatic tools used in drywall finishing; (D) identify the materials used in drywall finishing and describe the purpose and use of each type of material, including compounds, joint reinforcing tapes, trim materials, and textures and coatings; (E) finish drywall using hand tools; (F) recognize various types of problems that occur in drywall finishes;	Apply paint, stain and other finishes to various surfaces (i.e., drywall, plaster, wood, masonry and metal) using brushes and rollers. Apply paint, stain and other finishes to various surfaces (i.e., drywall, plaster, wood, masonry and metal) using spray equipment. Determine type and quantity of materials required for a given project. Demonstrate proper equipment clean up and storage according to current industry and OSHA standards.	

			(G) identify the causes and correct method for solving each type of problem that occurs in drywall finishes; and (H) patch damaged drywall The student knows the various types of trim used in finish work and the proper methods for selecting, cutting, and fastening trim. The student is expected to: (A) identify the different types of standard moldings and describe their uses; (B) make square and miter cuts using a miter box or power miter saw; (C) make coped joint cuts using a coping saw; and (D) select and use fasteners to install trim, including door trim, window trim, base trim, and ceiling trim.		
Window Replacement		Apply technical skills for replacing windows, window glass, screens, and window hardware.	Students will be able to perform the replacement of a window as well as glass and screens. The student is expected to: (A) identify various types of fixed, sliding, and swinging windows; (B) identify the parts of a window installation; (C) state the requirements for proper window installation; (D) install a pre-hung window	Perform glass window and screen repairs.	

Flooring Repairs		Apply skills in flooring repair and replacement.	The student selects and repairs various types of floor coverings, including carpet, vinyl tile, ceramic tile, and wood flooring systems. The student is expected to: (A) describe the methods used to install ceramic tile, carpet, and vinyl tile; (B) make repairs to ceramic tile, carpet, and vinyl tile; and (C) use and maintain the tools used for the installation and repair of floor systems, including wet saw, trowels, and carpet knives.	Demonstrate repair methods for a variety of flooring surfaces: • Replace ceramic tiles, carpeting, and vinyl tile • Repair wood flooring, baseboard, and trim. Demonstrate carpet and floor care using appropriate equipment (e.g., steam cleaners, floor machines).	
Door Installation and Repair		Apply skills in door installation and repair.	The student installs metal doors and related hardware in steel-framed, wood-framed, and masonry walls. The student is expected to: (A) identify various types of door jambs and frames and demonstrate the installation procedures for placing selected door jambs and frames in different types of interior partitions; (B) identify types of interior doors; (C) identify different types of interior door hardware and demonstrate the installation procedures for selected types;	Install and repair various doors and door parts including door frames and jambs. Install and repair lock sets and door closers.	

			(D) list and identify specific items included on a typical door schedule; and (E) demonstrate the procedures for placing and hanging a selected door.		
Basic Electrical Repair		Understand and apply concepts and technical skills related to electrical systems and components.	The Student is expected to be able to identify and make basic repair to electrical components and systems: (A) Identify the types of electrical systems found in residential and commercial buildings. (B) Identify various codes. (C) Explain basic components found in an electrical system. (D) Demonstrate the ability to wire and check circuit breakers. (E) Demonstrate the ability to interpret motor starter schematics. (F) Demonstrate the ability to wire lighting fixtures and ballasts. (G) Demonstrate the ability to wire a motor starter.	Determine the procedures necessary to safely replace or install electrical devices in a device box, such as a light fixture, receptacle, or switch.	
Electrical Systems Troubleshooting		Use troubleshooting procedures when solving a maintenance problem to maintain buildings and structures.	Troubleshoot components within an electrical system. Student is expected to: (A) Diagnose and correct control problems. (B) Troubleshoot a typical customer complaint on an electrical system.		

			(C) Recall and discuss electrical codes as they pertain to wiring methods. (D) Recall and discuss electrical codes as they pertain to grounding. (E) Recall and discuss electrical codes as they pertain to systems. (F) Recall and discuss electrical codes as they pertain to power supply (G) Recall and discuss electrical codes as they pertain to branch circuits. (H) Recall and discuss electrical codes as they pertain to safety.		
Basic Plumbing Repair		Apply knowledge and technical skills for plumbing repairs.	Student will be able to perform the following types of common plumbing repairs and maintenance: (A) Water closet repair (B) Localized stoppages (C) Disposals (D) P-Traps (E) Floor drains (F) Faucet repair or replacement.	Demonstrate basic plumbing repairs. • Repair faucets by installing washers or seats and springs. • Clear stoppages in drains and in toilets.	
Piping Systems		Apply knowledge of piping systems. Demonstrate skills necessary to fabricate and service the tubing, piping, and fittings utilized in accordance with accepted industry standards.	The student selects, prepares, connects, and installs copper and plastic piping and fittings. The student is expected to: (A) state the precautions that must be taken when installing piping;	Distinguish among different types of plastic plumbing pipe, fittings, valves, hanging, and support. Read and interpret manufacturer's	

			(B) select, cut, and bend the right copper tubing for the job; (C) safely connect tubing, using flare and compression fittings; (D) identify common valves and fittings, pipe hangers and supports for commercial settings. (E) determine the correct hardware and supports needed for pipe installations; (F) identify and install various types of plastic pipe and state their uses; (G) demonstrate various methods used to pressure test piping systems; (H) cut and join lengths of plastic pipe (I) describe the effects of temperature on piping system components, and explain the need for insulation; and (J) list routine maintenance considerations for piping systems. Students will demonstrate the proper and safe cutting, connecting, and installation of plastic, steel, iron, and copper pipes and fittings. Students will understand the importance of pressure-testing of an installed	instructions, construction drawings and specifications, and applicable codes to properly install plastic pipe, including measuring, cutting, joining, and supporting plastic pipe. Utilize the appropriate tools, equipment, PPE, and procedures to safely complete installations. Once installed, pressure test plastic pipe according to local plumbing code to verify installation was properly completed.	

			plumbing project and utilize different techniques to do so.		
Basics of HVAC		Explain the basic principles of heating, ventilating, and air conditioning & refrigeration systems.	The student is expected to display a basic understanding of HVAC systems and how they work by being able to: (A) describe the purpose and operation of the various electrical components used in HVAC equipment; (B) state and demonstrate the safety precautions that must be followed when working on electrical equipment; (C) make voltage, current, and resistance measurements using electrical test equipment; and (D) read and interpret common electrical symbols. Students will be able to identify the proper type of piping, tubing, and supports for plumbing projects. Students will describe procedures and precautions that must be taken when preparing and installing HVACR piping.	Demonstrate understanding of basic HVAC components and systems. Demonstrate basic procedures to troubleshoot common problems in heating and cooling systems.	
Weatherization, Insulation, and Waterproofing		Understand the concept and applications of weatherization for commercial properties.	The student selects and installs various types of insulation in walls, floors, and attics and becomes familiar with the uses and installation practices for vapor barriers and waterproofing materials. The student is expected to:		

			(A) demonstrate how to properly remove, replace, and install various types of insulation, including batt, rigid, and blown materials; (B) Demonstrate interior and exterior caulking; and (C) demonstrate how to use and install various vapor barriers and waterproofing materials.		