

Colorado CTE Course – Scope and Sequence

Course Name	Construction Technology I		Course Details	Credit = 1.0 Prerequisite: None	
			Course = 0.50 Carnegie Unit Credit		
Course Description	This is the foundation course to basic residential construction. Students will demonstrate competencies that are nationally recognized by the construction industry. Students will learn and practice structural framing of floors, walls, ceilings, and roofs. This course also includes the use of basic construction tools and machinery, applied math, and an introduction to blueprint reading. This course teaches students industry safety including the use of all machines and tools.				
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 #	17002	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
Workplace Employment Skills		Identify types of technology required to perform workplace tasks in the Architecture and Construction industry including computerized systems and essential project management practices. Acquire and accurately use Building and Construction Trades sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats.	The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to: (A) explain the role of an employee in the construction industry; (B) apply critical-thinking skills; (C) demonstrate the ability to solve problems using critical-thinking skills; (D) demonstrate knowledge of basic computer systems;	Explain the role of project management in the construction industry and identify common scheduling tools, software platforms, or systems used by local companies. Describe strategies used to promote collaboration, trust, and clear communication among internal and external parties on a job site. Practice effective verbal, nonverbal, written, and electronic communication	

			(E) explain common uses for computers in the construction industry; (F) define effective relationship skills; and (G) recognize workplace issues such as sexual harassment, stress, and substance abuse.	skills for working with colleagues, employers, clients, and other personnel while demonstrating the ability to: listen attentively, speak courteously and respectfully, resolve obstacles in construction, and respond to criticism.	
Safety		Understand important compliance, safety standards, and regulations that are implemented within the construction industry. Determine the role of risk management in the architecture and construction industry including, but not limited to, discussions focusing on liability insurance, sanitation, OSHA and EPA regulations, emergency situations, PPE, building code, MSDS, HazCom, and security issues. Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Building and Construction	The student understands that safe working standards are imperative in the classroom and in the field. The student is expected to: (A) explain the idea of a safety culture; (B) explain the importance of a safety culture in the construction crafts; (C) explain the role of Occupational Safety and Health Administration (OSHA) in job-site safety; (D) explain fall protection, ladder safety, stair safety, and scaffold safety procedures; (E) explain the importance of hazard communication (HazCom); (F) explain the importance of Safety Data Sheets (SDS); (G) explain OSHA's General Duty Clause;	Demonstrate safe working practices in the operation of tools, equipment, and materials handling. Prepare and present a toolbox safety talk to classmates. Complete safety test with 100 percent accuracy.	

		Trades sector workplace environment.	(H) explain OSHA 1926 CFR Subpart C; (I) identify causes of accidents; (J) identify impacts of accident costs; (K) identify struck-by hazards; (L) identify caught-in-between hazards; (M) identify other construction hazards on the jobsite, including hazardous material exposures, environmental elements, welding and cutting hazards, confined spaces, and fires; (N) define safe work procedures around electrical hazards; (O) define hazard recognition; (P) define risk assessment techniques; and (Q) demonstrate the use and care of appropriate personal protective equipment, including safety goggles and glasses, hard hats, gloves, safety harnesses, and safety shoes		
Building Phases and Materials		Understand common terminology for the construction industry as it relates to the management of a project and materials.	The student gains knowledge about building materials used in the construction industry. The student is expected to:	Compare and contrast between different types of building materials and their functionality. Create a visual or presentation that compares lumber by	

			(A) identify various types of building materials and their uses; (B) state the uses of various types of hardwoods and softwoods; (C) identify the different grades and markings of wood building materials; (D) describe the proper method of storing and handling building materials; (E) state the uses of various types of engineered lumber; (F) calculate the quantities of lumber and wood products using industry-standard methods; and (G) describe the fasteners, anchors, and adhesives used in construction work and explain their uses	type and grade and describe what they are used for. Analyze a basic project using various fasteners, anchors, and adhesives. Report on the best practices for industry applications that includes research on a new product, tool, or technique. Determine types and quantities of building materials required for project(s) by analyzing construction schedule(s).	
Tools and Equipment		Acquire and apply basic knowledge of using and maintaining construction-related tools and equipment. Demonstrate the professional and safe use of basic tools and equipment used in the building trades.	The student applies the proper and safe use of hand and power tools associated with carpentry. The student is expected to: (A) identify the hand tools commonly used by carpenters and describe their uses; (B) use hand tools in a safe and appropriate manner;	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, clamps, drills, grinders, sanders, etc. Students will identify specific regulations and maintenance requirements for	

			(C) state the general safety rules for operating all power tools, regardless of type; (D) identify the portable power tools commonly used by carpenters and describe their uses; and (E) use portable power tools in a safe and appropriate manner.	construction related equipment and tools.	
Drafting Principles		Differentiate between the different building trades' plans and specifications. Read and interpret plans, elevations, schedules, sections, and details contained on basic construction drawings.	The student interprets architectural and engineering working drawings and specifications. 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 construction drawings; (C) identify selected architectural symbols commonly used to represent materials on plans; (D) identify selected electrical, mechanical, and plumbing symbols commonly used on plans; (E) identify selected abbreviations commonly used on plans;	Demonstrate the use of the alphabet of lines and read and interpret basic codes. Compare differences in symbols and abbreviations between the building trades including electrical, mechanical, and plumbing. Inspect and interpret a full set of construction drawings and specifications for a construction project including civil, architectural, structural, mechanical, plumbing, electrical, and fire protection drawings and specifications. Read and interpret different drawing types including plan view	

				drawings, elevation view drawings, section drawings, detail drawings, and schedules. Explain the relationship between different types of drawing and the importance of cross-referencing different types of drawings with one another and cross-referencing drawings with specifications. Develop a materials takeoff based on architectural, engineering, and shop drawings.	
Concrete and Foundations		Students will understand the role concrete plays in the foundational integrity of a structure as footings or foundations.	The student knows the ingredients of concrete, various types of concrete, and methods to mix concrete. The student is expected to: (A) identify the properties of cement; (B) describe the composition of concrete; (C) perform volume estimates for concrete; (D) identify types of concrete reinforcement materials and describe their uses; (E) identify various types of footings and explain their uses;	Create a report or visual presentation that describes the properties and composition of different types of concrete distinguished by the proportions of main ingredients including cement, mineral and chemical admixtures, reinforcement, aggregates, and water. Apply the appropriate tools, equipment, and procedures to safely place concrete and cleanup after a concrete project. Work in teams to safely and properly employ tools	

			(F) identify the parts of various types of concrete forms; (G) explain the safety procedures associated with the construction and use of concrete forms; and (H) erect, plumb, and brace a simple concrete form with reinforcement	and personal protective equipment (PPE), and follow procedures to construct a simple concrete form, place concrete into the form, and strike-off (screed), level, smooth, edge, and joint concrete to finish the project. Draw on construction texts and other technical documents to compare and contrast types of foundation systems and footings. Create a written report or visual description outlining the structure and properties of each type. Describe the conditions, costs, and other factors that influence the decision to use each type of system.	
Flooring Systems		Identify the different types of framing systems including roof deck, exterior/interior walls, beams, girders, posts, and floor framing.	The student gains knowledge of wood framing and the layout and construction of wood-framed floor systems using common and engineered lumber. The student is expected to: (A) identify the different types of framing systems; (B) read and interpret drawings and specifications	Describe the procedures necessary to fasten sills to the foundation and construct a floor assembly. Complete a flooring project that demonstrates proper installation of floor assembly including bridging, joists, subfloor, and single floor system	

			to determine floor system requirements; (C) identify floor and sill framing and support members; (D) name the methods used to fasten sills to the foundation; (E) select the proper girder or beam size from a list of available girders or beams given specific floor load and span data; (F) list and recognize different types of bridging; (G) list and recognize different types of flooring materials; (H) explain the purposes of subflooring and underlayment; (I) select the appropriate fasteners to be used in various floor framing systems; (J) estimate the amount of material needed to frame a floor assembly; (K) lay out and construct a floor assembly; (L) install bridging; (M) install joists for a cantilever-floor; (N) install a subfloor using butt-joint plywood or	and use proper fastening techniques. Identify the components which make up a floor frame, analyzing the purpose of and interrelationships among each component and explaining the sequence in which each is constructed.	
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			oriented strand board panels; and (O) install a single floor system using tongue-and- groove (T&G) plywood or oriented strand board (OSB) panels		
Basic Framing		Understand basic framing systems and principles of framing for a residential construction project. Identify wall and ceiling framing components and describe the use of the parts to frame a wall, door and window openings.	The student knows how to lay out and frame walls and ceilings, rough-in door and window openings, construct corners and partition Ts, brace walls and ceilings, and apply sheathing. The student is expected to: (A) identify the components of a wall and ceiling layout; (B) describe the procedure for laying out a wood frame wall, including the installation of plates, corner posts, door and window openings, partition Ts, bracings, and firestops; (C) describe the correct procedure for assembling and erecting an exterior wall; (D) identify the common materials and methods used for installing sheathing on walls; (E) lay out, assemble, erect, and brace exterior walls for a frame building;	Distinguish among the basic types of wood framing systems, such as platform frames, balloon frames, and post-and- beam frames. Create a chart to define and compare the pros and cons of each, citing examples of when each is used. Explain the procedure to lay out a wood frame wall, defining and describing the components such as plates, studs, partitions, door and window openings, bracing, and other components. Plan, lay out, assemble, erect, and brace exterior wall(s) including plates, corner posts, door and window openings, partition Ts, bracing and plan for installation of fire stops.	

			(F) describe wall framing techniques used in masonry construction; (G) explain the use of metal studs in wall framing; (H) cut and install ceiling joists on a wood frame building; and (I) estimate the materials required for frame walls and ceilings	Develop estimate for the materials required for wall and ceiling framing for a residential home.	
Principles of Electrical Systems		Understand the relationship of the National Electric Code in the Construction Industry. Understand the basic electrical principles, tools and equipment, and how they are used in residential electrical installation, maintenance, and troubleshooting.	Student understands basic principles of electrical systems in the residential application of the construction industry. Student is expected to: (A) State the importance and basic applications of the National Electric Code (NEC) (B) Utilize the proper tools, equipment, and procedures to select and safely perform basic installation of device boxes according to drawings, specifications, and code requirements. (C) Utilizing test equipment such as a voltmeter, inspect and test an electrical wiring system for compliance according to drawings, specifications, and code requirements.	Describe how different levels of electrical shock affect the human body. Research current OSHA standards and other regulations specific to electrical systems to identify methods and equipment to reduce the risk of injury due to electrical shock. Drawing on evidence from textbooks and OSHA standards, apply lockout/tagout procedures to ensure safe working conditions. For example, perform a lockout/tagout to prepare to work on an electrical device. Citing technical data, explain the interrelationships among	

				sources of current, voltage, resistance, and power in electric circuits and the units to quantify each (amperes, volts, ohms and watts). Demonstrate understanding of the operation of electrical circuits (series, parallel, and series-parallel circuits) and relate it to the physical laws, such as Ohm's law and Kirchhoff's law, that govern the behavior of electrical circuits and devices such as the function of resistors in electrical circuits. Accurately apply these physical laws to solve problems. For example, use Ohm's law to calculate the current flow of a circuit for an electric dryer with a given voltage and resistance. Install and test an electrical box according to drawings, specifications, and applicable code for the electrical outlet location.	
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Roofing Systems		Identify roof framing components and describe the use of the parts to frame a gable and hip roof including trusses and rafters.	The student gains knowledge of various types of framed roofs and how to frame these roofs using both stick-build and truss-build systems. The student is expected to: (A) demonstrate an understanding of the terms associated with roof framing; (B) identify the roof framing members used in gable and hip roofs; (C) identify the methods used to calculate the length of a rafter; (D) identify the various types of trusses used in roof framing; (E) use a framing square, speed square, and calculator in laying out a roof; (F) identify various types of sheathing used in roof construction; (G) frame a gable roof with vent openings; (H) erect a gable roof using trusses; (I) frame a roof opening; and (J) estimate the materials used for framing and sheathing a roof	Demonstrate the use of common framing tools such as framing square, speed square, and calculator. Plan, lay out, assemble, erect, and brace a gable roof with vent openings using trusses. Develop estimate(s) for the materials required for roof framing project(s).	

Windows, Doors, and Skylights		Identify various types of fixed, sliding, and swinging windows. Identify common types of exterior doors such as entry, sliding, French, storm, etc.	The student gains knowledge of various types of windows, skylights, and exterior doors. 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; (E) identify the common types of exterior doors and explain how they are constructed; (F) identify the parts of a door installation; (G) identify types of thresholds used with exterior doors; (H) install a pre-hung exterior door; (I) identify the various types of locksets used on exterior doors and explain how the locksets are installed; (J) install a lockset; and (K) identify and explain the use and installation of various door and window hardware, including security hinges, keepers, deadbolts, and peep holes	Research various door and window types and present a proposal to a client based on the findings, including: cost considerations, application or features, thermal efficiency, mold prevention, etc. Demonstrate preparation techniques to install a window and/or door.	
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Stair Installations		Identify stair components and common building code requirements for residential construction applications.	The student is introduced to various types of stairs and the common building code requirements related to stairs. The student is expected to: (A) identify the various types of stairs; (B) identify the various parts of stairs; (C) identify the materials used in the construction of stairs; (D) interpret construction drawings of stairs; (E) calculate the total rise, number and size of risers, and the number and size of treads required for a given stairway; (F) lay out and cut stringers, risers, and treads; and (G) build a small stair unit with a temporary handrail	Present to a potential client on a stair installation project that includes: (A) code or regulations that pertain to the installation of stairs in a residential project; (B) drawing that identifies the parts of stairs including the step, tread, riser, nosing, stringer, winders, trim, banister, base rail, and fillet; (C) estimate for materials and installation that compares 2 different stair types (straight, quarter turn (L-shape), half turn (U-shape), winder, spiral, curved, and ladders).	
Career Planning and Development		Identify interests, abilities, aptitudes, values, and personality traits as they relate to career planning, to develop a keen understanding of the value and benefit of work, and to differentiate between jobs and careers. Understand the various career opportunities within the Architecture and Construction industry.	The student identifies various opportunities in the field of carpentry and the characteristics a carpenter should possess. The student is expected to: (A) identify job opportunities and their accompanying job duties such as carpentry, building maintenance supervisor, architect, and engineer; and (B) research careers along with the education, job skills,	Develop a career plan designed to achieve their career goals within this industry. Referencing data from U.S. Department of Labor and other sources, explain an apprenticeship. Write persuasively to describe the benefits of the apprenticeship approach of on-the-job training paired with related	Updates to student ICAP Reflect on coursework experiences and revise and refine the career plan generated in the prior course, using technology where

		Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans.	and experience required to achieve them	training for individuals seeking construction careers. Use a variety of sources to gather data, cite each source, and briefly describe why the chosen source is reliable.	appropriate. Include photographs or illustrations and written descriptions of sequential progress in construction projects.
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Academic Standards Alignment

Colorado CTE courses are required to integrate academic and essential skills into course content. The following academic standards have been identified as aligned to this course and should be integrated throughout instruction.

[CO CTE Academic Standards Resources](#) (Rubrics, integration strategies, etc) [CDE Colorado Academic Standards Online](#) (Online standards lookup tool)

Reading, Writing, & Communicating

Standard 1: Oral Expression and Listening

- **Prepared Graduate 1:** Collaborate effectively as group members or leaders who listen actively and respectfully; pose thoughtful questions, acknowledge the ideas of others; and contribute ideas to further the group's attainment of an objective.
- **Prepared Graduate 2:** Deliver effective oral presentations for varied audiences and varied purposes.

Standard 2: Reading for All Purposes

Prepared Graduate 3: Read a wide range of literary texts to build knowledge and to better understand the human experience.

- **Prepared Graduate 4:** Read a wide range of informational texts to build knowledge and to better understand the human experience.
- **Prepared Graduate 5:** Understand how language functions in different contexts, command a variety of word-learning strategies to assist comprehension, and make effective choices for meaning or style when writing and speaking.

Standard 3: Writing and Composition

- **Prepared Graduate 7:** Craft informational/explanatory texts using techniques specific to the genre.
- **Prepared Graduate 8:** Craft narratives using techniques specific to the genre.
- **Prepared Graduate 9:** Demonstrate mastery of their own writing process with clear, coherent, and error-free polished products.

Standard 4: Research Inquiry and Design

- **Prepared Graduate 10:** Gather information from a variety of sources; analyze and evaluate its quality and relevance; and use it ethically to answer complex questions.

Note: Mathematics and Science standards will be added in the future. Visit the [Colorado Academic Standards](#) page for the most current version.