

Colorado AFNR Course Scope and Sequence

Course Name	Plumbing & Electrical Installation		Course Details	Level 4 course in the Power, Structure, & Technology pathway. This course aligns with the construction strand.		
			Course = 0.50 Carnegie Unit Credit			
Course Description	Students will acquire knowledge and basic skills in electrical and plumbing technologies including how to identify and use power and hand tools; how to be safe on the jobsite and when using hand and power tools. Plumbing skills will include how to identify, fit, and use industry relevant plumbing pipe materials such as copper, PVC, poly, etc. Plumbing system design and troubleshooting will also be addressed. In addition, students will be introduced to gas, drainage, and water supply systems and continue their knowledge of workplace basics and green technologies. Skills in the electrical area include electrical theory, tool identification and use, electrical codes, installation of electrical equipment, and the reading of electrical drawings, schematics, and specifications.					
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 #	18401	Schedule calculation based on 60% of a semester instructional time. 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						
Unit Number, Title and Brief Description	Suggested % of Instructional Time	CTE or Academic Standard Alignment	Competency / Performance Indicator	Outcome / Measurement	CTSO Integration	
Unit 1: Lab & workplace safety <ul style="list-style-type: none"> Review of lab safety & expansion of workplace safety expectations 	2%	PST.02. Operate and maintain AFNR mechanical equipment and power systems.	PST.02.02. Operate machinery and equipment while observing all safety precautions in AFNR settings.	PST.02.02.02.b. Apply safety principles and applicable regulations to operate equipment, machinery and power units used in AFNR power, structural and technical systems.		
Unit 2: Electrical & Plumbing Careers <ul style="list-style-type: none"> Understanding certification, entry level training necessary, post-secondary opportunities and job opportunities 	3%	CRP.10. Plan education and career path aligned to personal goals.	CRP.10.02. Examine career advancement requirements (e.g., education, certification, training, etc.) and create goals for continuous growth in a chosen career.	CRP.10.02.01.b. Analyze the steps to meet career advancement requirements for potential careers		

<p>Unit 3: Review of electrical theory & application</p> <ul style="list-style-type: none"> Theory & Application Amps Ohms Volts Watts Ohm's law Conductors & Insulators 	2%	<p>PST.03. Service and repair AFNR mechanical equipment and power systems.</p>	<p>PST.03.02. Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods.</p>	<p>PST.03.02.01.a. Compare and contrast basic units of electricity (e.g., volts, amps, watts, and ohms) and the principles that describe their relationship (e.g., Ohm's Law, Power Law, etc.).</p>	
<p>Unit 4: Electrical Blueprints</p>	3%	<p>PST.03. Service and repair AFNR mechanical equipment and power systems</p>	<p>PST.03.02. Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods.</p>	<p>PST.03.02.02.b. Analyze and interpret electrical system symbols and diagrams.</p>	
<p>Unit 5: Electrical Fixtures & Materials</p> <ul style="list-style-type: none"> Identification & Applications 	3%	<p>PST.04. Plan, build and maintain AFNR structures.</p>	<p>PST.04.04. Apply electrical wiring principles in AFNR structures. SCIENCE: SC.HS.1.8</p>	<p>PST.04.04.02.a. Distinguish electrical circuits and the components of each</p>	
<p>Unit 6: NEC</p> <ul style="list-style-type: none"> Purpose Application How to read Other reference materials and guides 	2%	<p>PST.04. Plan, build and maintain AFNR structures.</p>	<p>PST.04.04. Apply electrical wiring principles in AFNR structures. SCIENCE: SC.HS.1.8</p>	<p>PST.04.04.01.b. Assess and analyze the electrical requirements of an AFNR structure.</p>	
<p>Unit 7: Using the NEC application for...</p> <ul style="list-style-type: none"> Selection of conductors Ampacity Length of runs Voltage drop Ampacity Charts Understanding conductor designation 	7%	<p>PST.04. Plan, build and maintain AFNR structures.</p>	<p>PST.04.04. Apply electrical wiring principles in AFNR structures. SCIENCE: SC.HS.1.8</p>	<p>PST.04.04.01.c. Install and/or repair fixtures following appropriate codes and standards.</p>	

Unit 8: Service Entrance & Distribution Panels, Circuit Protection	6%	PST.04. Plan, build and maintain AFNR structures.	PST.04.04. Apply electrical wiring principles in AFNR structures. <u>SCIENCE: SC.HS.1.8</u>	PST.04.04.02.c. Plan and wire electrical circuits (i.e., single pole switch, three-way switch, duplex outlet, etc.).	
Unit 9: GFCI & AFCI	2%	PST.04. Plan, build and maintain AFNR structures.	PST.04.04. Apply electrical wiring principles in AFNR structures. <u>SCIENCE: SC.HS.1.8</u>	PST.04.04.02.a. Distinguish electrical circuits and the components of each.	
Unit 10: Wiring Branch Circuits <ul style="list-style-type: none"> • Pulling Wire • Setting boxes • Connecting fixtures 	12%	PST.04. Plan, build and maintain AFNR structures.	PST.04.04. Apply electrical wiring principles in AFNR structures. <u>SCIENCE: SC.HS.1.8</u>	PST.04.04.02.c. Plan and wire electrical circuits (i.e., single pole switch, three-way switch, duplex outlet, etc.).	
Unit 11: Low Voltage Control Systems <ul style="list-style-type: none"> • Thermostats, relays, transformers 	5%	PST.03 Service and repair AFNR mechanical equipment and power systems.	PST.03.02. Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods.	PST.03.02.02.a. Compare and contrast the characteristics of electronic components used in AFNR power, structural and technical systems (e.g., battery, resistor, diode, transistor, capacitor, etc.).	
Unit 12: High Voltage Circuits <ul style="list-style-type: none"> • 220 single phase • 3 phase circuits 	3%	PST.04. Plan, build and maintain AFNR structures.	PST.04.04. Apply electrical wiring principles in AFNR structures. <u>SCIENCE: SC.HS.1.8</u>	PST.04.04.02.a. Distinguish electrical circuits and the components of each.	
Plumbing					
Unit 13: Blueprints	3%	PST.04. Plan, build and maintain AFNR structures.	PST.04.01. Create sketches and plans for AFNR structures.	PST.04.01.01.a. Interpret and explain the meaning of symbols used in sketches of agricultural structures.	
Unit 14: Plumbing Math <ul style="list-style-type: none"> • Pressures • Flow Rate • Pipe size • Static and Dynamic Pressure • Friction Loss • Velocity loss 	7%	PST.04 Plan, build, and maintain AFNR structures.	PST.04.02 Determine structural requirements, specifications, and estimate costs of AFNR structure.	PST.04.02.01.a Summarize and categorize the information needed to complete a bill of materials and cost estimate for an AFNR structure.	

(Rain bird irrigation Manuel)					
Unit 15: Plumbing code & regulations	2%	PST.04 Plan, build, and maintain AFNR structures.	PST.04.02 Determine structural requirements, specifications, and estimate costs of AFNR structure.	PST.04.02.02.b Assess and analyze local building code requirements for agriculture structures.	
Unit 16: Plumbing materials and components <ul style="list-style-type: none"> Types, identification, and application, proper materials for specific applications 	3%	PST.04 Plan, build, and maintain AFNR structures.	PST.04.03 Follow architectural and mechanical plans to construct, maintain and/or repair AFNR structures (e.g. material selection, site preparation and/or layout plumbing, concrete/masonry.etc)	PST.04.03.04.a Compare and contrast the characteristics of materials used in plumbing and water systems (e.g. copper, PVC, PEX, etc)	
Unit 17: Building plumbing systems <ul style="list-style-type: none"> Supply vs. Waste Pressure vs. Non Pressure 	4%	PST.04 Plan, build, and maintain AFNR Structures	PST.04.02 Determine structural requirements, specifications, and estimate costs of AFNR structure.	PST.04.02.02.a Research and summarize sources of industry construction and materials standard and their importance (e.g. American National Standards Institute, ANSI Underwriters' Laboratories, UL, etc)	
Unit 18: Joining/Testing plumbing materials, PVC, PE, PEX, copper, steel, ABS, similar and non-similar	18%	PST.04 Plan, build, and maintain AFNR Structures	PST.04.03 Follow architectural and mechanical plans to construct, maintain and/or repair AFNR structures (e.g. material selection, site preparation and/or layout plumbing, concrete/masonry.etc)	PST.04.03.04.a Compare and contrast the characteristics of materials used in plumbing and water systems (e.g. copper, PVC, PEX, etc)	
Unit 19: Plumbing system layout & design <ul style="list-style-type: none"> Installing basic plumbing fixtures 	10%	PST.04. Plan, build and maintain AFNR structures.	PST.04.03. Follow architectural and mechanical plans to construct, maintain and/or repair AFNR structures (e.g., material selection, site preparation and/or layout, plumbing, concrete/ masonry, etc.).	PST.04.03.04.c. Install and/or repair pipes and plumbing equipment and fixtures in AFNR structures.	

<p>Unit 20: Rural Waste systems</p> <ul style="list-style-type: none"> Design operation, and impact of soil characteristics 	2%	PST.04. Plan, build and maintain AFNR structures.	PST.04.03. Follow architectural and mechanical plans to construct, maintain and/or repair AFNR structures (e.g., material selection, site preparation and/or layout, plumbing, concrete/masonry, etc.).	PST.04.03.04.a. Compare and contrast the characteristics of materials used in plumbing and water systems (e.g., copper, PVC, PEX, etc.).	
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CAS Academic Standards Alignment: Online Version: <https://www.cde.state.co.us/apps/standards/>; Download version: <https://www.cde.state.co.us/apps/standards/>

Science:

- SC.HS.1.8 – Force fields (gravitational, electric, and magnetic) contain energy and can transmit energy across space from one object to another.

Essential Skills:

Problem Solver:

- Critical Thinking and Analysis: The ability to apply a deliberate process of identifying problems, gathering information, and weighing possible solutions, including: making choices rooted in understanding patterns, cause-and-effect relationships, and the impacts that a decision can have on the individual and others.
- Creativity and innovation: the ability to demonstrate curiosity and imagination through experimenting with new and emerging ideas.

Empowered Individual:

- Self-Awareness: the ability to understand one's own emotions, thoughts, and values, and how personal actions and emotions influence behavior across contexts, including: the capacity to recognize one's strength and limitations with a well-grounded sense of confidence and purpose.
- Career Awareness: The ability to apply the knowledge and understanding of how one's dreams, experiences, and interests translate into career fulfillment and lifelong pursuits in local, regional, national, and global career pathways and opportunities.