

Colorado AFNR Course Scope and Sequence

Course Name	Metal Fabrication		Course Details	Level 4 course in the Power, Structure, & Technology pathway. This is the second course in the metal fabrication strand.		
			Course = 0.50 Carnegie Unit Credit			
Course Description	This course entails the application of basic metal welding skills to the construction of items through the fabrication process. Skills include project blueprint development, welding blueprint symbol interpretation, bill of materials, fabrication process determination, construction skills and quality control.					
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 #	18404	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 lab safety Expansion of Workplace safety expectations 	2%	PST.01. Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural and technical systems.	PST.01.02. Apply physical science and engineering principles to design, implement, and improve safe and efficient mechanical systems in AFNR situations. <i>SCIENCE: SC.HS.1.6</i> <i>SC.HS.1.7</i> <i>SC.HS.1.9</i>	PST.01.02.02.c Devise and document processes to safely implement and evaluate the safe use of AFNR related tools, machinery, and equipment.		
Unit 2: Welding Careers & understanding welder qualification testing <ul style="list-style-type: none"> Entry level training necessary, post-secondary opportunities Welding vs welding fabrication 	2%	CRP.10. Plan education and career path aligned to personal goals.	CRP.10.01 Identify career opportunities within a career cluster that match personal interests, talents, goals, and preferences.	CRP.10.01.02.a Examine career clusters and identify potential career opportunities based on personal interests, talents, goals, and preferences.		

<p>Unit 3: Mathematical applications in welding</p> <ul style="list-style-type: none"> Measuring & numeric understanding <ul style="list-style-type: none"> Tape Measure reading review Basic right angle trigonometry (length of side, angle of fitting) 	2%	<p>PST.01 Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural, and technical systems.</p>	<p>PST.01.02. Apply physical science and engineering principles to design, implement, and improve safe and efficient mechanical systems in AFNR situations. SCIENCE: SC.HS.1.6 SC.HS.1.7 SC.HS.1.9</p>	<p>PST.01.02.01.b Perform mathematical calculations to determine the mechanical advantage of simple machines in AFNR related mechanical systems.</p>	
<p>Unit 4: Testing & Evaluation – Application of Skill throughout project:</p> <ul style="list-style-type: none"> Visual examination/inspection of welded assemblies Locating weld discontinuities Selection of repair method Repairing weld discontinuities Post evaluation 	1%	<p>PST.01 Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural, and technical systems.</p>	<p>PST.01.03 Apply physical science principles to metal fabrication using a variety of welding and cutting processes (e.g. SMAW, GMAW, GTAW ,fuel-oxygen, and plasma arc torch, etc)</p>	<p>PST.01.03.01.c Evaluate the quality of metal fabrication procedures (e.g. SMAW, GMAW, GTAW, fuel-oxygen, and plasma arch torch, etc)</p>	
<p>Unit 5: Creating or reading blueprints & welding symbols based on project concept</p> <ul style="list-style-type: none"> Choose Project Create or use existing blueprint Decipher welding symbols 	3%	<p>PSTS.04 Demonstrate skills in project completion on individual and group projects.</p>	<p>PSTS.04.01 Utilize blueprints in completing an agricultural mechanics project.</p>	<p>PSTS.04.01.a Students will identify blueprints, their components, and describe their purpose.</p> <p>PSTS.04.01.b Read blueprints with accuracy.</p>	
<p>Unit 6: Selection of Project Factors:</p> <ul style="list-style-type: none"> Base metal style, size, and thickness for project design Welding process, filler metal, shielding gas (if necessary) Joint configuration for project design 	3%	<p>PST.01 Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural, and technical systems.</p>	<p>PST.01.03 Apply physical science principles to metal fabrication using a variety of welding and cutting processes (e.g. SMAW, GMAW, GTAW ,fuel-oxygen, and plasma arc torch, etc)</p>	<p>PST.01.03.02.b Assess and select the proper electrode for use in various shielded metal arc welding situations.</p> <p>PST.01.03.01.a Compare and contrast the principles and procedures of different</p>	

<ul style="list-style-type: none"> • Metal processing equipment • Cleaning- pre assembly • Grinding/finishing method- post assembly 				welding and cutting processes (e.g. SMAW, GMAW, GTAW, fuel-oxygen, and plasma arc torch, etc)	
<p>Unit 7: Project Design & Construction</p> <ul style="list-style-type: none"> • Bill of Materials • Construction steps • Welding joint skill development <ul style="list-style-type: none"> - Technique - Machine setting for like material thickness and joint design • Use of different equipment: drill press, hydraulic shear, cold cut saw, chop saw, metal band saw, plasma cutter, welding equipment • Surface preparation and finish • Complete project • Visual examination – post weld. 	6%	PST.01 Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural, and technical systems.	PST.01.03 Apply physical science principles to metal fabrication using a variety of welding and cutting processes (e.g. SMAW, GMAW, GTAW ,fuel-oxygen, and plasma arc torch, etc)	<p>PST.01.03.01.b Analyze the situation and determine the best welding and cutting process to be used in metal fabrication.</p> <p>PST.01.03.02.c Construct and/or repair metal structure and equipment using metal fabrication procedures.</p>	

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.1.6 – Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system.
- SC.HS.1.7 – Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems.
- SC.HS.1.9 – Although energy cannot be destroyed, it can be converted to less useful forms as it is captured, stored, and transferred.

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.