

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 - 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. SCIENCE: SC.HS.1.6 SC.HS.1.7 SC.HS.1.9	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 Entry level training necessary, post-secondary opportunities	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.	

Welding vs welding fabrication					
Unit 3: Mathematical applications in welding - Measuring & numeric understanding - Tape Measure reading review - Basic right angle trigonometry (length of side, angle of fitting)	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.01.02.01.b Perform mathematical calculations to determine the mechanical advantage of simple machines in AFNR related mechanical systems.	
Unit 4: Testing & Evaluation – Application of Skill throughout project: - Visual examination/inspection of welded assemblies - Locating weld discontinuities - Selection of repair method - Repairing weld discontinuities - Post evaluation	1%	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)	PST.01.03.01.c Evaluate the quality of metal fabrication procedures (e.g. SMAW, GMAW, GTAW, fuel-oxygen, and plasma arch torch, etc)	
Unit 5: Creating or reading blueprints & welding symbols based on project concept - Choose Project - Create or use existing blueprint	3%	PSTS.04 Demonstrate skills in project completion on individual and group projects.	PSTS.04.01 Utilize blueprints in completing an agricultural mechanics project.	PSTS.04.01.a Students will identify blueprints, their components, and describe their purpose. PSTS.04.01.b Read blueprints with accuracy.	

Decipher welding symbols					
Unit 6: Selection of Project Factors: - Base metal style, size, and thickness for project design - Welding process, filler metal, shielding gas (if necessary) - Joint configuration for project design - Metal processing equipment - Cleaning- pre assembly - Grinding/finishing method- post assembly	3%	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)	PST.01.03.02.b Assess and select the proper electrode for use in various shielded metal arc welding situations. PST.01.03.01.a Compare and contrast the principles and procedures of different welding and cutting processes (e.g. SMAW, GMAW, GTAW, fuel-oxygen, and plasma arc torch, etc)	
Unit 7: Project Design & Construction - Bill of Materials - Construction steps - Welding joint skill development - Technique - Machine setting for like material thickness and joint design - Use of different equipment: drill press, hydraulic shear, cold cut saw, chop saw,	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)	PST.01.03.01.b Analyze the situation and determine the best welding and cutting process to be used in metal fabrication. PST.01.03.02.c Construct and/or repair metal structure and equipment using metal fabrication procedures.	

metal band saw, plasma cutter, welding equipment • Surface preparation and finish • Complete project • Visual examination – post weld.					
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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 \(Online standards lookup tool\)](#)

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.

Students collaborate to interpret fabrication drawings, safely operate fabrication equipment, complete metal fabrication projects, and solve production challenges while working effectively as members of a fabrication team.

Prepared Graduate 2: Deliver effective oral presentations for varied audiences and varied purposes.

Students communicate fabrication plans, manufacturing processes, project progress, and quality expectations through demonstrations, technical discussions, and project presentations using appropriate fabrication terminology.

Standard 2: Reading for All Purposes

Prepared Graduate 4: Read a wide range of informational texts to build knowledge and to better understand the human experience.

Students interpret blueprints, fabrication drawings, welding symbols, equipment manuals, material specifications, and safety documentation to fabricate and evaluate metal products.

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.

Students apply fabrication and manufacturing terminology while interpreting technical documents, following fabrication procedures, documenting projects, and communicating with instructors and team members.

Prepared Graduate 3 (literary texts) is not directly addressed by this course.

Standard 3: Writing and Composition

Prepared Graduate 7: Craft informational/explanatory texts using techniques specific to the genre.

Students prepare fabrication plans, material estimates, project documentation, process records, and technical reports that explain fabrication procedures, manufacturing processes, and completed projects.

Prepared Graduate 9: Demonstrate mastery of their own writing process with clear, coherent, and error-free polished products.

Students produce organized technical documentation, fabrication records, project plans, and quality control documentation that accurately communicate fabrication procedures and project outcomes.

Prepared Graduate 6 (argument writing) and Prepared Graduate 8 (narrative writing) are not explicitly supported by the course standards.

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.

Students research fabrication methods, metal properties, manufacturing processes, equipment specifications, and industry standards to select appropriate materials, develop fabrication plans, troubleshoot production challenges, and produce quality metal products.

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