

Colorado AFNR Course Scope and Sequence

Course Name	Advanced Welding Technology		Course Details	Level 3 course in the Power, Structure, & Technology pathway. This course aligns with the metal fabrication strand.	
			Course = 0.50 Carnegie Unit Credit		
Course Description	Advanced Welding Technology is an advanced course educating students in the advanced skills and knowledge in metal fabrication. Students will build on the skills and competencies presented in prerequisite courses. Students will learn cutting and welding applications of increasing complexity used in the manufacturing/metal fabrication industry. Student will be proficient in fundamental safety practices in welding, general industry-based metal fabrication skills, multiple welding processes, project management, quality control methods, and further advanced welding/metal fabrication technology and processes.				
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,	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,	PST 01.03.01.c. Evaluate the quality of metal fabrication procedures (e.g. SMAW, GMAW, GTAW, fuel-oxygen, and plasma arc torch, etc)	

post-secondary opportunities - Welder Qualification testing and common code awareness - AWS (D1.1- Structural Steel) - ASME (Section IV Pressure Vessel) - API (1104- Cross Country Pipeline)		CRP.10. Plan education and career path aligned to personal goals.	fuel-oxygen, and plasmas arch torch, etc) 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.	
Unit 3: Review of process & joins covered in Prin PSTS - SMAW 6010 & 7018 - GMAW – short circuit .025 - .035 75/25 or 100% CO2 gas - Flat position – lap, tee, edge, corner - Material Type - Various thickness of plate, tubing and/or angle - Filler materials & gas selection review	7%	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.b Assess and select the proper electrode for use in various shielded metal arc welding situations. PST. 01.03.02.c Construct and/or repair metal structures and equipment using metal fabrication procedures.	

Unit 4: Advanced Welding Positions • SMAW – 6010 & 7018 - Horizontal - Vertical up & down (7018 up only) - Overhead • GMAW – short circuit - Horizontal - Vertical up and down (down on thinner material only gauge through 3/16" - Overhead	26%	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.b Assess and select the proper electrode for use in various shielded metal arc welding situations. PST. 01.03.02.c Construct and/or repair metal structures and equipment using metal fabrication procedures.	
Unit 5: Mathematical Applications in Welding • Measuring & Numeric understanding - Understanding fractions and how they apply - Proper use and reading of a tape measure	2%	PST.01 Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structure, and technical systems.	PST.01.02 Apply physical science and engineering principles to design, implement, and improve safe and efficient mechanical systems in AFNR situation. <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 6: Blueprint reading and welding	4%	PSTS.04 Demonstrate skills in project completion on	PSTS.04.01 Utilize blueprints in completing an	PSTS.04.01.a Students will identify blueprints,	

		individual and group projects	agricultural mechanics project.	their components, and describe their purpose. PSTS.04.01.b Read blueprints with accuracy	
Unit 7: Small project design & construction Individual choice or following a blueprint	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.	
Unit 8: Groove Welds - Square Grooves and Bevel Grooves - Joint Preparation - Based on material thickness and joint style - Bevel angle/groove angle - Root face - Root opening - Tacking - Weld Sequence - Root pass, hot pass (if appropriate), fill passes and cover passes - Pipe Joints	15%	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.b Assess and select the proper electrode for use in various shielded metal arc welding situations. PST.01.03.02.c Construction and/or repair metal structures and equipment using metal fabrication procedures.	
Unit 9: Supplemental Content		PST.01 Apply physical science principles and engineering applications to	PST.01.03 Apply physical science principles to metal fabrication using a variety of	PST.01.03.01.b Analyze the situation and determine the best	

• FCAW (Flux core) • GTAW (TIG) • GMAW – Spray Transfer		solve problems and improve performance in AFNR power, structural, and technical systems.	welding and cutting processes (e.g. SMAW, GMAW, GTAW, fuel-oxygen, and plasma arc torch, etc)	welding and cutting process to be used in metal fabrication. PST.01.03.02.c Construction and/or repair metal structures and equipment using metal fabrication procedures.	
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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 with classmates and instructors to plan fabrication projects, interpret engineering drawings, follow welding procedures, solve production challenges, and safely complete advanced welding projects.

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

Students communicate fabrication plans, welding procedures, project progress, and completed work using appropriate technical terminology during demonstrations, project reviews, and career readiness activities.

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 Welding Procedure Specifications (WPS), blueprints, fabrication drawings, welding codes, technical manuals, and equipment documentation to safely produce high-quality welded 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 welding and manufacturing terminology while interpreting technical documents, documenting fabrication processes, and communicating with instructors and team members in professional shop settings.

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, project documentation, welding records, material lists, and technical reports that explain welding procedures, fabrication 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 career materials that accurately communicate welding 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 welding processes, base metals, filler materials, fabrication methods, welding codes, and industry standards to develop fabrication plans, select appropriate procedures, troubleshoot welding challenges, and produce quality welds.

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