

SCOPE AND SEQUENCE

Course Name: Welding and Fabrication 1

(Level 2 offered 2025/26; curriculum under construction)

Instructor: Dylan Vose

Career Cluster: Construction

sub-cluster Production, Manufacturing, Maintenance

HS Course Credits: 3 credits per year (1 math, 1 science, 1 elective)

Technology credit option for VUHS; Design credit option for MUHS

Fast Forward Optional Credits: none

Tier 2 Credentials: American Welding Society SENSE Certification (AWS sense welder level 1), NCCER Core, NCCER-W

Tier 1 Credentials:(none)

Recommended Preparation for Success in This Course: Basic math abilities (addition, subtraction, multiplication, and division) with whole numbers, fractions, and decimals, as well as fundamental customary and metric measuring skills. Capable of physical labor in both job site and classroom settings, possess fine and gross motor skills, and be able to read and comprehend course materials at a 10th-12th grade reading level.



Tagline: “Spark your future!”

Student appeal: Ignite the sparks of creativity in our welding program! Imagine stepping into a room where metal becomes your canvas, and you are the master sculptor of molten art. Join other students who enjoy creating things with their hands, just like YOU, as we dive into the fascinating world of welding. From crafting sturdy structures to shaping detailed designs, you'll learn the skills that bring metal to life. Guided by experienced welders, you'll not only create practical pieces but also unleash your artistic side. Be a part of a hands-on journey where sparks fly, and you mold your future in the world of welding.

Course Description:

This first year of a two-year, half-day program is designed to equip students with hands-on skills and knowledge to enter multiple industries as an entry level welder. Welding students will gain in-depth, hands-on experiences in principles of metallurgy; print reading, measurement, and properties of metals; safety procedures and machine operation; metal-fabricating and joining methods; SMAW, thermal cutting, codes, inspections, and certifications. Throughout the course, students will design and manage welding productions, hone their creative and technical abilities, and gain project management and quality assurance experience. From crafting practical structures to creating artistic projects, students gain proficiency in welding, cutting, and shaping metals. Work-study experiences may be available.

Proficiencies/Learning Targets:

LT 1: SAFETY: I understand and adhere to safety procedures and associated processes in welding.

LT 2: THERMAL CUTTING: I am competent in the theoretical and practical use of thermal cutting processes including OAC, PAC, and CAC.

LT 3: SMAW: I can demonstrate the proper techniques that lead to surfacing welds that meet structural code.

LT 4: SMAW: I can demonstrate the proper techniques that lead to fillet welds that meet structural code.

LT 5: SMAW: I can demonstrate the proper techniques that lead to groove welds that meet structural code.

LT 6: WELDING BLUEPRINTS: I can interpret welding blueprints accurately and prepare materials accordingly.

LT 7: INSPECTION AND TESTING: I can ensure the quality and integrity of welds through testing and inspection techniques.

LT 8: CAREER READINESS: I can develop a resume that reflects the professional skills, competencies, and transferable workplace skills necessary for success in the welding industry.

LT9: GMAW: I can demonstrate the proper techniques that lead to surfacing welds that meet structural code requirements.

LT10: GMAW: I can demonstrate the proper techniques that lead to fillet welds that meet structural code.

LT11: GMAW : I can demonstrate the proper techniques that lead to structurally sound fabricated structures.

LT12: material preparation: I can use welding adjacent auxiliary equipment to prepare and fit weldments to specified dimensions.

LT13: MATH: I can use available data to create predictive cost models based on customer needs.

LT14: MATH: I can use geometry with various units of measurement to design and fabricate specified weldments.

LT15: MATH: I can add, subtract, and multiply imperial and metric measurements.

Standards: Standards are aligned with [Vermont's CTE Welding](#) Critical Proficiencies Anchor Standards (VT), which derive from and are aligned with the Common Career Technical Core Standards for the Architecture and [Construction](#) Career Cluster (AC) and the [Manufacturing](#) Career Cluster (MN) as well as with [NCCER and AWS guidelines](#).

Additional standards alignment includes:

PAHCC [Habits of Work](#): Safety, Work Ethic, Reliability, People Skills

PAHCC [Transferable Skills](#): Creative and practical problem solving; Inquiry; Informed and Integrated Thinking.

[CCTC - Career Ready Practices](#)

Unit and Essential Question(s)	Estimated # of Classes Periods <i>(assumes 120-minute classes)</i>	Learning Targets
Unit 1: INTRODUCTION TO WELDING AND WELDING SAFETY (NCCER Welding 1 – Module 1) <i>What careers exist in welding, and how might the skills found in these areas be useful in other fields or industries?</i> <i>What safe practices do I need to demonstrate?</i>	5 Classes	Learning Targets: LT 1, LT 2, LT 8 • Demonstrate use of all welding Personal Protective Equipment. • Demonstrate proper and safe work practices in the welding work area. • Demonstrate proper “Hot Zone” preparation. • Demonstrate safe and proper use and inspection of ventilation equipment. • Demonstrate proper inspection and operation of equipment used for each required welding and thermal cutting process. (This is done as part of the process module for each of the required welding and thermal cutting processes.) • Pass a written program-specific “Welding Safety Exam.”

Unit 2: WELDING PROCESSES (NCCER Welding 1 – Module 6) <i>How do the principles and techniques of Shielded Metal Arc Welding (SMAW) ensure the safety, quality, and compliance of welding practices in various positions and applications?</i> <i>What are the key factors in troubleshooting, operating, and maintaining SMAW equipment, and how do these practices contribute to successful welding outcomes?</i>	60 classes	Learning Targets: LT 1, LT2, LT 3, LT 4 SHIELDED METAL ARC WELDING (SMAW) THEORY • Describe how to safely set-up, adjust, operate, and shut down SMAW equipment. • Describe SMAW fundamentals: arc length, electrode angles, amps, manipulation, and travel speed. • Describe SMAW equipment. (power source type, polarity, etc.). • Describe SMAW electrodes, their numeric designation, and their uses. • Describe how to strike the arc, maintain correct arc length, read the puddle, and deposit a weld of the correct size. SHIELDED METAL ARC WELDING (SMAW) PRACTICAL • Troubleshoot and repair common problems associated with SMAW welding machines. • Perform pad work in all positions. • Perform fillet welds in all positions. • Perform groove welds in all positions. • Read, understand, and set-up equipment in accordance with an approved AWS Standard Welding Procedure. • Pass a welder performance qualification test in accordance with AWS D1.1 Structural Steel Code
Unit 3: THERMAL CUTTING PROCESSES (NCCER Welding 1 Modules 2 and 3) <i>What is necessary to safely use oxy-fuel, plasma, and air carbon arc cutting</i>	30 Classes	Learning Targets: LT 1, LT 2, LT 4, LT 5 (level 1-2) OXY-FUEL CUTTING (OFC) THEORY • Describe how to safely set-up, test for leaks, adjust, operate, and shut down an OFC torch. • Identify specific levels of cylinder content and working pressures related to OFC. OXY-FUEL CUTTING (OFC) PRACTICAL • Demonstrate how to change fuel and oxygen cylinders. • Demonstrate how to change and clean cutting tips.

<i>equipment, from setting up to practical applications?</i> <i>What equipment adjustments and part replacements might be necessary?</i>		• Demonstrate a straight cut, beveled cut, radius cut, and piercing on carbon steel. PLASMA ARC CUTTING (PAC) THEORY • Describe how to safely set up, adjust, operate, and shutdown the PAC equipment. PLASMA ARC CUTTING (PAC) PRACTICAL • Demonstrate how to replace all consumable torch parts. • Demonstrate a straight cut, radius cut, and piercing on carbon steel. AIR CARBON ARC CUTTING (CAC-A) THEORY • Describe how to safely set up, adjust, operate, and shutdown the CAC-A equipment using industry-specific terminology. AIR CARBON ARC CUTTING (CAC-A) PRACTICAL • Demonstrate how to replace all consumable parts. • Observe a demonstration (or operate) CAC-A equipment on carbon steel.
Unit 4: Fabrication Fundamentals (NCCER Welding 2 – Module 8 and 9) <i>How do basic print terms, abbreviations, and line types contribute to understanding welding drawings, and how do they facilitate accurate interpretation for welding purposes?</i> <i>How do size and location dimensioning aid in accurately interpreting welding shop drawings, and what role do they play in ensuring precise fabrication?</i> (NCCER Welding 1 – Module 4 and 7)	60 Classes	Learning Targets: LT 1, LT2, LT 6, LT 13, LT 14, LT 15 DRAWINGS AND WELDING SYMBOLS • Recognize and identify title block, basic print terms, abbreviations, and line types. • Understand and read size and location dimensioning. • Develop a project bill of materials based on a welding shop drawing. • Read and interpret an AWS welding symbols chart. • Design blueprint and fabricate weldment to predefined specifications. LAYOUT AND MEASUREMENT • Define: tolerance, bend allowance, and units of measurement used in metal fabrication. • Describe the use of a decimal equivalent chart.

How can metalworkers ensure safety and maximize effectiveness when using power tools for material preparation in welding, and what are the key principles of their proper usage to prevent accidents and ensure optimal results?

- Demonstrate the proper use of common hand tools: carpenter square, combination square, tape measure, fillet weld gauges, sheet metal gauge, protractor, dial calipers.
- Layout material so it may be fabricated to the specifications on a shop drawing.
- Layout materials to the +/- tolerance that is specified on the shop drawing.
- Describe and/or demonstrate how to square, level, and plumb a project.
- Layout a project to allow for maximum utilization of the material.

MATERIAL PREPARATION

- Explain and demonstrate safe practices and the proper use of power tools required for material preparation.
- Describe how to control material distortion.
- Prepare a weldment by grinding, cutting, or cleaning material to meet the specifications on the shop drawing.

Trade mathematics (level 2)

- TBD

Unit 5: Inspection and Testing (NCCER Welding 1 – Module 5) <i>How do metalworkers read, understand, and explain an AWS standard welding procedure, and what steps are involved in setting up and adjusting welding equipment in accordance with these procedures?</i> <i>What are the different destructive and non-destructive testing methods used in welding inspection, and how do welding inspection acronyms such as VT, PT, MT, RT, and UT relate to these methods?</i>	5 Classes	Learning Targets: LT1, LT 2, LT 6, LT 7 CODES, STANDARDS, PROCEDURES • Read, understand, and explain an AWS standard welding procedure. • Set up and adjust welding equipment in accordance with an AWS standard welding procedure. INSPECTION METHODS (level 1-2) • Describe Destructive and Non-Destructive testing methods. • Define welding inspection acronyms and their relationship to the inspection methods. VT, PT, MT, RT, UT • Identify and describe common weld discontinuities and their causes. • Witness a guided bend test and interpret/discuss the results. METALLURGY (level 2)
Unit 6: PORTFOLIO <i>How can I best showcase my abilities through a portfolio of my work?</i>	5 Classes	Learning Targets: LT 8 • Portfolio completion (physical and virtual) • Career exploration • Workplace readiness: résumé, welder's statement

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