Introduction to Metal Fabrication

Introduction to Metal Fabrication is a course that provides students with opportunities to examine safety and technical information in metal fabrication and to participate in hands-on activities in the laboratory. Topics include career opportunities, safety, identification and selection, metal preparation and finishing, metal cutting, weld quality, and shielded metal arc welding (SMAW).

Content standards for this course are not intended to serve as the entire curriculum. Teachers are encouraged to expand the curriculum beyond the limits of these content standards to accommodate specific community interests and utilize local resources. This course encourages critical thinking, use of the scientific method, integration of technology, development of student leadership skills, and application of knowledge and skills related to practical questions and problems. Safety concepts are integrated into instruction to the maximum extent possible.

This course may be taught as a one-credit or half-credit course. For a half-credit course, content standards 1, 2, 3, 4, 6, 9, 12, and 13 must be included.

Career and technical student organizations are integral, cocurricular components of each career and technical education course. These organizations serve as a means to enhance classroom instruction while helping students develop leadership abilities, expand workplace-readiness skills, and broaden opportunities for personal and professional growth.

Career Opportunities

Students will:

1. Identify careers available in metal fabrication.

2. Describe the history of metal fabrication and its impact on the industry.
   Examples: history—blacksmithing, oxyfuel development, arc welding, metal inert gas (MIG) welding, tungsten inert gas (TIG) welding
   impact—automated systems making jobs obsolete, reduction in number of workers in job market

Safety

3. Demonstrate safety procedures used in the metal fabrication industry.

Identification and Selection

4. Explain uses of metal fabrication tools and equipment.
   Examples: tools—hacksaw, cold chisel, file, drill, chipping hammer, metal vise grips, grinder, striker, tip cleaner, wire brush, tongs
   equipment—welding helmet, fuel valves, oxyfuel torches

5. Differentiate among types of metal used in metal fabrication.
   Examples: iron, aluminum, steel, tin, titanium, copper, magnesium, chromium, zinc
Metal Preparation and Finishing

6. Demonstrate techniques for preparing metal for fabrication.
   Examples: stripping, cleaning, grinding, buffing

Metal Cutting

7. Prepare an oxyfuel unit for operation.
   • Explaining color-coding of oxyfuel tanks and hoses
     Examples: green for oxygen, orange or black for acetylene
   • Comparing shaded lenses used in oxyfuel welding and cutting
   • Checking for cracks and leaks in oxyfuel hoses and regulators

8. Use an oxyfuel torch, including adjusting the flame to neutral and cutting and fusing metal.

9. Demonstrate procedures for using plasma arc cutting equipment.
   • Describing the plasma arc cutting process
   • Identifying components of plasma arc cutting equipment
   • Cutting metal with a plasma arc cutter

Weld Quality

10. Analyze weld imperfections to determine corrective measures.

11. Compare destructive and nondestructive weld testing methods.

Shielded Metal Arc Welding

12. Explain the SMAW process.
    • Comparing various types of welding electrodes used in SMAW
      Examples: E6010, E6013, E7014

13. Demonstrate procedures for adjusting and operating the SMAW machine.
    • Identifying various types of weld joints
      Examples: butt, lap, corner, T
    • Contrasting methods of striking an arc
      Examples: scratching, tapping, weaving
    • Identifying types of welds
      Examples: stringer, overlap, fillet
    • Demonstrating techniques for flat, vertical, horizontal, and overhead welding
Metal Assembly

15. Cut metal threads using a die.
16. Explain the process of laying out and cutting sheet metal.
17. Demonstrate the use of rivets in sheet metal assembly.