

# STRANDS AND STANDARDS

## METALWORKING 1



### Course Description

This is an entry-level course in Metalworking. Through demonstrations, lectures, research and practical experiences is designed to introduce the student to a broad experience in the use of; equipment, tools, materials, processes and techniques of metalworking trades. This is a one-semester course of instruction.

<b>Intended Grade Level</b>	10-12
Units of Credit	0.5
Core Code	40.10.00.00.085
Concurrent Enrollment Core Code	N/A
Prerequisite	Welding Technician – Intermediate Level
Skill Certification Test Number	N/A
Test Weight	N/A
<b>License Type</b>	CTE and/or Secondary Education 6-12
<b>Required Endorsement(s)</b>	
Endorsement 1	Machine Tool or Welding
Endorsement 2	N/A
Endorsement 3	N/A



## STRAND 1

**Students will understand the relationship of metals, manufacturing and how it impacts the world we live in.**

### Standard 1

Understand basic elements of the metalworking industry.

- Identify career opportunities in metal fabrication.
- Describe the integration of metalworking into construction schedules.

### Standard 2

Define the term technology.

### Standard 3

Explain how various types of technology contribute to advances in industry.

## STRAND 2

**Students will be able to understand safe practices in a metals shop.**

### Standard 1

Follow safety manuals and all safety regulations and requirements.

### Standard 2

Use protective equipment.

- Wear protective safety clothing as recommended by OSHA, UOSHA, and the Utah State Risk Management Office.
- Maintain and use appropriate protective guards and equipment on machinery.
- Locate and properly use protective equipment.
- Use lifting aids when necessary.

### Standard 3

Follow safe operating procedures for hand and power machine tools.

- Identify and understand safe machine operating procedures.
- Demonstrate safe machine operations at all times.

### Standard 4

Maintain a clean and safe work environment.

- Keep work areas clean.
- Clean machine and hand tools when work is completed.
- Put tools away when work is finished.
- Keep aisles clear of equipment and materials.
- Perform preventive maintenance as required.
- Understand chemical hazards and the use of Material Safety Data Sheets (MSDS).
- Keep storage rooms well organized and free of clutter.

## Standard 5

Request a courtesy UOSHA or State Risk Management inspection at least every 2 years.

- Keep accurate records of and take appropriate action on their findings.
- Make a copy of their findings available to your administration.

## Standard 6

Each student should earn a score of 100% on a required safety exam relating to general shop safety and each machine tool he/she will be operating.

## Performance Skill

Understand safe practices in a metals shop.

- Follow safety manuals and all safety regulations and requirements.
- Use protective equipment.
- Follow safe operating procedures for hand and power machine tools.
- Maintain a clean and safe work environment.
- Request a courtesy UOSHA or State Risk Management inspection at least every 2 years.
- Each student should earn a score of 100% on a required safety exam relating to general shop safety and each machine tool he/she will be operating.

## STRAND 3

**Students will be able to apply mathematical concepts.**

### Standard 1

Perform basic arithmetic functions.

- Add, subtract, multiply, and divide whole numbers.
- Add, subtract, multiply, and divide fractions.
- Add, subtract, multiply, and divide decimals.
- Use a ruler or measuring tape to measure within a sixteenth ( $1/16$ ) of an inch.

### Standard 2

Convert fractions to decimal equivalents.

- Convert fractions to decimal equivalents.
- Convert decimal values to nearest fraction equivalent.
- Use Decimal Equivalent Chart for conversions.

### Standard 3

Convert metric to inch measurements.

- Convert inch dimensions to metric.
- Convert metric dimensions to inch.
- Use metric/inch conversion chart.

### Performance Skill

Apply mathematical concepts.

- Perform basic arithmetic functions.
- Convert fractions to decimal equivalents.
- Convert metric to inch measurements.

## STRAND 4

**Students will be able to interpret engineering drawings.**

### Standard 1

Review blueprints.

- Identify types of lines within a drawing.

### Standard 2

Identify basic layout of drawings.

- Identify types of lines within a drawing.
- Identify item number symbols.
- Identify general note symbols.
- List the essential components found in the title block.
- Locate bill of materials on a drawing.

### Standard 3

Identify basic types of drawings.

- Identify orthographic views.
- Identify positions of views (top, front, side, and auxiliary).
- Visualize one or more views from a given view.
- Identify isometric views.
- Determine the scale of the view or section.

### Performance Skill

Interpret engineering drawings.

- Review blueprints.
- Identify basic layout of drawings.
- Identify basic types of drawings.

## STRAND 5

**Students will understand the relationship of metals, machines and processes.**

### Standard 1

Explain how metals are classified.

### Standard 2

Describe the properties and characteristics of many different metals.

### Standard 3

Identify how metals and alloys are developed for specific applications.

### Performance Skill

Understand the relationship of metals, machines and processes.

- Explain how metals are classified.
- Describe the properties and characteristics of many different metals.
- Identify how metals and alloys are developed for specific applications.

## STRAND 6

**Students will understand metal forming operations and processes using both hand and machine tools.**

### Standard 1

Sheet-metal operations and processes.

- Explain the need for patterns and stretch-outs.
- Use the different methods for pattern development.
- Cut and bend sheet metal using a number of different tools.
- Identify and use a variety of sheet metal tools.
- Make hems, edges, and seams in sheet metal.
- Bend sheet metal into three-dimensional shapes using machines.
- Join sheet metal sections with rivets and other mechanical fasteners.
- Apply sheet metal safety rules.

### Standard 2

Forging operations and processes.

- Identify the tools used in hand forging.
- Demonstrate several forging techniques.
- Bend, draw out, and upset metal by hand forging.
- Practice hand forging safety rules.
- Explain industrial forging processes.

### Standard 3

Welding operations and processes.

- Describe the basic welding processes.
- Identify the parts of a gas welding outfit.
- Recognize basic weld joints.
- Safely light, adjust, and use a gas torch.
- Select the correct rod and flux for a job.
- Prepare a joint for gas welding.
- Explain the difference between welding and brazing.
- Dress properly and use safety precautions when welding.
- List various components of SMAW system.

- Interpret basic welding symbols.
- Select the proper electrode for the job.
- Perform basic SMAW operations.

## Standard 4

Foundry operations and processes.

- Explain various casting techniques.
- Explain the sand casting process.
- Demonstrate the correct way to make a silicon mold with pewter.
- Demonstrate the correct way to make a green sand casting with aluminum.
- Describe simple patterns, split patterns, and match plate patterns.
- Heat and pour molten metal safely.
- Use a pyrometer.
- Follow safe casting procedures.

## Standard 5

Metal machining operations and processes.

- Explain the operation of typical grinding machines.
- Adjust and prepare a grinding machine for operation.
- Select and safely use the correct drill and drilling machine for a given job.
- Make safe setups on a drill press.
- Calculate cutting speeds.
- Understand drill size classifications.
- Properly drill, countersink, counter bore, and tap steel.
- Select proper coolant for drilling select materials.
- Identify various types of drilling machines.
- Properly use a hand hack saw.
- Describe the operation of the three principle metal-cutting power saws.
- Mount work properly for sawing.
- Safely operate a power saw.
- Describe how a lathe works.
- Identify the various parts of a lathe.
- Sharpen lathe cutting tools.
- Safely setup and operate a lathe using various work-holding devices.
- Practice proper safety precautions when operating metal cutting machines.

## Performance Skill

Understand metal forming operations and processes using both had and machine tools.

- Sheet-metal operations and processes.
- Forging operations and processes.
- Welding operations and processes.
- Foundry operations and processes.
- Metal machining operations and processes.

## STRAND 7

**Students will understand the importance of career readiness skills as it relates to the workplace and outlined in the SkillsUSA Framework – Level 3.**

### Standard 1

Understand and develop collaboration skills.

- Develop a working relationship with a mentor.
- Apply supervisory skills.
- Manage a project and evaluate others.

### Standard 2

Understand and demonstrate change management skills.

- Evaluate your career and training goals.
- Identify and apply conflict resolution skills.
- Illustrate an organizational structure.
- Plan and implement a leadership project.

### Standard 3

Understand how customer service applies to the workplace.

- Serve as a volunteer in the community.
- Examine workplace ethics: the role of values in making decisions.
- Understand the cost of customer service.
- Develop customer service skills.
- Maximize customer service skills.

### Standard 4

Understand and demonstrate career readiness.

- Market your career choice.
- Research resume writing.
- Demonstrate interviewing skills.
- Predict employment trends.
- Re-evaluate career goals and establish long-term goals.
- Construct a job search network.
- Evaluate professional competencies.
- Analyze your entry-level job skills.
- Design and present a lesson plan on an aspect of your career choice.
- Write an article for a professional journal in your career area.
- Refine your employment portfolio.