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.

<table>
<thead>
<tr>
<th>Intended Grade Level</th>
<th>10-12</th>
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<td>Units of Credit</td>
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<td>Core Code</td>
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<td>Concurrent Enrollment Core Code</td>
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<tr>
<td>Prerequisite</td>
<td>Welding Technician – Intermediate Level</td>
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<tr>
<td>Skill Certification Test Number</td>
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<td>Test Weight</td>
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<td>License Type</td>
<td>CTE and/or Secondary Education 6-12</td>
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<td>Required Endorsement(s)</td>
<td>Machine Tool or Welding</td>
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<td>Endorsement 1</td>
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<td>Endorsement 3</td>
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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.