

Metals Materials and Processes

Power Standards

1. Students will develop an understanding of the nature of metalworking technology.
2. Students will develop an understanding of metalworking design.
3. Students will develop abilities for a technological world in metals, materials, and processes.

Power Benchmarks

1. Apply industrial shop safety.
2. Read drawings and blueprints.
3. Determine planning, measurement, and layout.
4. Practice sheet metal processes
5. Practice machining / separating processes
6. Practice metal casting and forming processes
7. Practice metal combining processes
8. Practice boring / drilling processes
9. Practice CNC (computer numerical control) machining
10. Discover metalworking careers and career planning strategies

Metals Materials and Processes

Students should be able to:

1. Students will develop an understanding of the nature of metalworking technology.
 - Apply industrial shop safety. (1)
 - Discover Metalworking Careers and Career Planning Strategies. (10)

2. Students will develop an understanding of metalworking design.
 - Read drawings and blueprints. (2)
 - Determine planning, measurement, and layout. (3)

3. Students will develop abilities for a technological world in metals, materials, and processes.
 - Practice sheet metal processes (4)
 - Practice machining / separating processes (5)
 - Practice metal casting and forming processes (6)
 - Practice metal combining processes (7)
 - Practice boring / drilling processes (8)
 - Practice CNC (computer numerical control) machining (9)

Metals Materials and Processes

Stage 1 – Desired Results:

| <p>Power Standard 1: Students will develop an understanding of the nature of metalworking technology.</p> <p>Power Benchmark/Competency #1: Apply industrial shop safety.</p> <p>Estimated Timeline:</p> | <p>Place ‘X’ in square if goal addresses Essential/Content Standard(s).</p> <table border="1" style="width: 100%; text-align: center; border-collapse: collapse;"> <thead> <tr style="background-color: #ffffcc;"> <th style="padding: 2px;">Career</th> <th style="padding: 2px;">Technology</th> <th style="padding: 2px;">Critical Thinking</th> <th style="padding: 2px;">Personal Responsibility</th> <th style="padding: 2px;">Global & Cultural</th> </tr> </thead> <tbody> <tr> <td></td> <td>X</td> <td>X</td> <td>X</td> <td></td> </tr> <tr style="background-color: #ffffcc;"> <th style="padding: 2px;">Math</th> <th style="padding: 2px;">Science</th> <th style="padding: 2px;">Reading</th> <th style="padding: 2px;">Social Responsibility</th> <th style="padding: 2px;">Communication</th> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> | Career | Technology | Critical Thinking | Personal Responsibility | Global & Cultural | | X | X | X | | Math | Science | Reading | Social Responsibility | Communication | | | | | |
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| Math | Science | Reading | Social Responsibility | Communication | | | | | | | | | | | | | | | | | |
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| <p>Understandings: <i>Students will understand that:</i></p> <ul style="list-style-type: none"> ➤ Shop safety is important. ➤ Following shop safety procedures is essential when preventing accidents. ➤ Safety factors influence the decision-making process. ➤ Choosing appropriate tools to solve problems and make decisions is critical to safety. ➤ Apply decision making process helps promote safety. ➤ OSHA safety regulations must be followed. | <p>Essential Questions:</p> <ul style="list-style-type: none"> ➤ What is safety? ➤ What does safety mean to you? ➤ What does OSHA do? ➤ Why should you follow safety regulations? ➤ Why are there so many safety incidents in the USA? | | | | | | | | | | | | | | | | | | | | |
| <p>Students will: (<i>know</i>) ... (Include vocabulary)</p> <ul style="list-style-type: none"> ➤ Observe general safety practices in metalworking. ➤ Recognize common safety equipment and protective clothing used in metalworking. ➤ State the importance of safe work habits. ➤ Vocabulary: Rotary motion, MSDS, OSHA and pinch points. | <p>Students will be able to: (i.e. do)... (Include vocabulary)</p> <ul style="list-style-type: none"> ➤ Notify instructor immediately in case of accident or injury. ➤ Identify a safety hazard. ➤ Describe common safety violations relating to the Metalworking shop. ➤ Describe common safety violation relating to shop materials. | | | | | | | | | | | | | | | | | | | | |

Stage 2 – Assessment Evidence

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| <p>Performance Tasks: (i.e. Assessment used to determine proficiency on competency)</p> <ul style="list-style-type: none"> ➤ Safety exams | <p>Key Criteria: (Rubric)</p> <ul style="list-style-type: none"> ➤ Safety Exams |
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Metals Materials and Processes

| Stage 3 – Learning Plan: Apply industrial shop safety. Power Benchmark/Competency: # 1 | |
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| Learning Activities: | Resources: |
| Chapter review | |
| Classroom procedures | |
| Safety demonstrations | |
| ➤ Drill press, shears, bending equipment, hand tools, mill, lathe, horizontal band saw, metal chop saw, and foundry procedures. | |
| ➤ General shop safety | |
| ➤ Safety exams | |
| All tools and equipment used in metalworking shop | |
| Classroom discussion | |
| MSDS worksheet | |
| Introduction to occupational safety health administration (OSHA) | |
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Stage 3
 Work in Progress

Metals Materials and Processes

Stage 1 – Desired Results:

| <p>Power Standard 2: Students will develop an understanding of metalworking design.</p> <p>Power Benchmark/Competency #2: Apply industrial shop safety.</p> <p>Estimated Timeline:</p> | <p>Place ‘X’ in square if goal addresses Essential/Content Standard(s).</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #ffffcc;"> <th style="padding: 2px;">Career</th> <th style="padding: 2px;">Technology</th> <th style="padding: 2px;">Critical Thinking</th> <th style="padding: 2px;">Personal Responsibility</th> <th style="padding: 2px;">Global & Cultural</th> </tr> </thead> <tbody> <tr> <td></td> <td>X</td> <td>X</td> <td></td> <td></td> </tr> <tr style="background-color: #ffffcc;"> <th style="padding: 2px;">Math</th> <th style="padding: 2px;">Science</th> <th style="padding: 2px;">Reading</th> <th style="padding: 2px;">Social Responsibility</th> <th style="padding: 2px;">Communication</th> </tr> <tr> <td>X</td> <td></td> <td>X</td> <td></td> <td>X</td> </tr> </tbody> </table> | Career | Technology | Critical Thinking | Personal Responsibility | Global & Cultural | | X | X | | | Math | Science | Reading | Social Responsibility | Communication | X | | X | | X |
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| X | | X | | X | | | | | | | | | | | | | | | | | |
| <p>Understandings: <i>Students will understand that:</i></p> <ul style="list-style-type: none"> ➤ Pictorial drawings are used in industry. ➤ Reading working drawing is a valuable metalworking skill. ➤ Dimensioning is essential to understanding drawing rules. | <p>Essential Questions:</p> <ul style="list-style-type: none"> ➤ What is the relationship between industry and understanding drawings? ➤ What types of prints can be developed for industrial use? ➤ Why did industry start using working drawings? | | | | | | | | | | | | | | | | | | | | |
| <p>Students will: (<i>know</i>) ... (Include vocabulary)</p> <ul style="list-style-type: none"> ➤ Identify the different types of information indicated on a typical drawing. ➤ Vocabulary – Pictorial, working, and multi-view Drawings. Dimensions, Scale, tolerances, blueprints, and arrowheads. | <p>Students will be able to: (i.e. do) ... (Include vocabulary)</p> <ul style="list-style-type: none"> ➤ Draw or sketch pictorial drawings, as appropriate, to communicate product ideas within the shop. ➤ Read drawings dimensioned in fractional and decimal inches and metric units. ➤ Complete a project plan sheet. ➤ Produce a working drawing. | | | | | | | | | | | | | | | | | | | | |

Stage 2 – Assessment Evidence

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| <p>Performance Tasks: (i.e. Assessment used to determine proficiency on competency)</p> <ul style="list-style-type: none"> ➤ Quiz | <p>Key Criteria: (Rubric)</p> |
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Metals Materials and Processes

Stage 1 – Desired Results:

| <p>Power Standard 2: Students will develop an understanding of metalworking design.</p> <p>Power Benchmark/Competency #3; Determine planning, measurement, and layout.</p> <p>Estimated Timeline:</p> | <p>Place 'X' in square if goal addresses Essential/Content Standard(s).</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #ffffcc;"> <th style="padding: 2px;">Career</th> <th style="padding: 2px;">Technology</th> <th style="padding: 2px;">Critical Thinking</th> <th style="padding: 2px;">Personal Responsibility</th> <th style="padding: 2px;">Global & Cultural</th> </tr> </thead> <tbody> <tr> <td style="padding: 2px;"></td> <td style="padding: 2px;">X</td> <td style="padding: 2px;">X</td> <td style="padding: 2px;"></td> <td style="padding: 2px;"></td> </tr> <tr style="background-color: #ffffcc;"> <td style="padding: 2px;">Math</td> <td style="padding: 2px;">Science</td> <td style="padding: 2px;"></td> <td style="padding: 2px;">Social Responsibility</td> <td style="padding: 2px;">Communication</td> </tr> <tr> <td style="padding: 2px;">X</td> <td style="padding: 2px;"></td> <td style="padding: 2px;"></td> <td style="padding: 2px;"></td> <td style="padding: 2px;"></td> </tr> </tbody> </table> | Career | Technology | Critical Thinking | Personal Responsibility | Global & Cultural | | X | X | | | Math | Science | | Social Responsibility | Communication | X | | | | |
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| X | | | | | | | | | | | | | | | | | | | | | |
| <p>Understandings: <i>Students will understand that:</i></p> <ul style="list-style-type: none"> ➤ Mathematics is critical to planning, measurement, and layout work. ➤ Measurement is used to solve problems. ➤ Cost estimation is essential to planning projects. ➤ Layout work is related to accuracy of project development. | <p>Essential Questions:</p> <ul style="list-style-type: none"> ➤ How is measurement used in industry? ➤ How is measurement used in the world? ➤ How would you use measurement to solve problems? ➤ What is tolerance? ➤ What does scale mean in regards to measurement? | | | | | | | | | | | | | | | | | | | | |
| <p>Students will: (know) ...(Include vocabulary)</p> <ul style="list-style-type: none"> ➤ Apply basic measuring instruments such as rulers, protractors, and basic transfer tools including an outside calipers (KSAO 6.1). ➤ Define the major units used within the metric system. ➤ Describe the importance of accurate measurement as it relates to the interchangeability of parts. ➤ Vocabulary: Interchangeability, tolerance, and symmetry. | <p>Students will be able to: (i.e. do)...(Include vocabulary)</p> <ul style="list-style-type: none"> ➤ Describe the importance of accuracy of measurement as it relates to the interchangeability of parts. ➤ Convert measurements to metrics (KSAO 6.4). ➤ Measure accurately to 1/64 of an inch. ➤ Transfer measurement to different scales. ➤ Estimate costs of projects. | | | | | | | | | | | | | | | | | | | | |

Stage 2 – Assessment Evidence

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| <p>Performance Tasks: (i.e. Assessment used to determine proficiency on competency)</p> <ul style="list-style-type: none"> ➤ Measurement worksheet ➤ Chapter review questions ➤ Measurement lab ➤ Measurement exam ➤ Scaling lab | <p>Key Criteria: (Rubric)</p> <ul style="list-style-type: none"> ➤ Measurement exam |
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Metals Materials and Processes

Stage 3 – Learning Plan:

Determine planning, measurement, and layout.

Power Benchmark/Competency: # 3

| Learning Activities: | Resources: |
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| Read chapter | |
| Chapter review | |
| Measurement worksheet | |
| Measurement lab | |
| Classroom discussion | |
| Scaling lab | |
| Plan of procedure | |
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Metals Materials and Processes

Stage 1 – Desired Results:

| <p>Power Standard 3: Students will develop abilities for a technological world in metals, materials, and processes.</p> <p>Power Benchmark/Competency #4 Practice sheet metal processes.</p> <p>Estimated Timeline:</p> | <p>Place 'X' in square if goal addresses Essential/Content Standard(s).</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #ffffcc;"> <th style="padding: 2px;">Career</th> <th style="padding: 2px;">Technology</th> <th style="padding: 2px;">Critical Thinking</th> <th style="padding: 2px;">Personal Responsibility</th> <th style="padding: 2px;">Global & Cultural</th> </tr> </thead> <tbody> <tr> <td style="padding: 2px;"></td> <td style="padding: 2px;">X</td> <td style="padding: 2px;"></td> <td style="padding: 2px;">X</td> <td style="padding: 2px;"></td> </tr> <tr style="background-color: #ffffcc;"> <th style="padding: 2px;">Math</th> <th style="padding: 2px;">Science</th> <th style="padding: 2px;">Reading</th> <th style="padding: 2px;">Social Responsibility</th> <th style="padding: 2px;">Communication</th> </tr> <tr> <td style="padding: 2px;"></td> <td style="padding: 2px;"></td> <td style="padding: 2px;"></td> <td style="padding: 2px;"></td> <td style="padding: 2px;"></td> </tr> </tbody> </table> | Career | Technology | Critical Thinking | Personal Responsibility | Global & Cultural | | X | | X | | Math | Science | Reading | Social Responsibility | Communication | | | | | |
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| <p>Understandings: <i>Students will understand that:</i></p> <ul style="list-style-type: none"> ➤ OSHA has outline safety regulations for the use of sheet metal. ➤ Sheet metal is made by passing a metal slab between rolls. ➤ There are a variety of sheet metal careers. | <p>Essential Questions:</p> <ul style="list-style-type: none"> ➤ What do you use sheet metal for? ➤ What professions use sheet metal? | | | | | | | | | | | | | | | | | | | | |
| <p>Students will: (know) ...(Include vocabulary)</p> <ul style="list-style-type: none"> ➤ Identify sheet metal equipment and describe functions. ➤ Compare and contrast operations of sheet metal equipment. ➤ Describe uses of sheet metal. ➤ Describe processes involving sheet metal. ➤ Vocabulary: bend allowance, bar folder, cornice brake, box and pan, and shears. | <p>Students will be able to: (i.e. do)...(Include vocabulary)</p> <ul style="list-style-type: none"> ➤ Cut and bend sheet metal using a number of tools. ➤ Create sheet metal patterns. ➤ Create sheet metal projects. ➤ Join sheet metal sections with rivets and spot welds. ➤ Make hems, edges, and seams in sheet metal. | | | | | | | | | | | | | | | | | | | | |

Stage 2 – Assessment Evidence

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| <p>Performance Tasks: (i.e. Assessment used to determine proficiency on competency)</p> <ul style="list-style-type: none"> ➤ Chapter review questions ➤ Sheet metal projects | <p>Key Criteria: (Rubric)</p> <ul style="list-style-type: none"> ➤ Sheet metal projects |
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Metals Materials and Processes

Stage 3 – Learning Plan:
Practice sheet metal processes.
Power Benchmark/Competency: # 4

| Learning Activities: | Resources: |
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| Chapters related to sheet metal | |
| Sheet metal handouts | |
| Sheet metal projects | |
| Sheet metal layout review | |
| Demonstrations | |
| ➤ Bar folder, cornice brake, box and pan, and shears | |
| Cutting sheet metal – shears and tin snips | |
| Fastening sheet metal- spot welding and rivets | |
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Metals Materials and Processes

Stage 1 – Desired Results:

| <p>Power Standard 3: Students will develop abilities for a technological world in metals, materials, and processes.</p> <p>Power Benchmark/Competency #5: Practice machining / separating processes.</p> <p>Estimated Timeline:</p> | <p>Place ‘X’ in square if goal addresses Essential/Content Standard(s).</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #ffffcc;"> <th style="padding: 2px;">Career</th> <th style="padding: 2px;">Technology</th> <th style="padding: 2px;">Critical Thinking</th> <th style="padding: 2px;">Personal Responsibility</th> <th style="padding: 2px;">Global & Cultural</th> </tr> </thead> <tbody> <tr> <td style="padding: 2px;"></td> <td style="padding: 2px;">X</td> <td style="padding: 2px;"></td> <td style="padding: 2px;">X</td> <td style="padding: 2px;"></td> </tr> <tr style="background-color: #ffffcc;"> <th style="padding: 2px;">Math</th> <th style="padding: 2px;">Science</th> <th style="padding: 2px;">Reading</th> <th style="padding: 2px;">Social Responsibility</th> <th style="padding: 2px;">Communication</th> </tr> <tr> <td style="padding: 2px;"></td> <td style="padding: 2px;"></td> <td style="padding: 2px;"></td> <td style="padding: 2px;"></td> <td style="padding: 2px;"></td> </tr> </tbody> </table> | Career | Technology | Critical Thinking | Personal Responsibility | Global & Cultural | | X | | X | | Math | Science | Reading | Social Responsibility | Communication | | | | | |
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| <p>Understandings: <i>Students will understand that:</i></p> <ul style="list-style-type: none"> ➤ OSHA has outline safety regulations for the use of machining and separating processes. ➤ Machining processes are changing due to new technology. ➤ Machining careers are changing in skill levels. | <p>Essential Questions:</p> <ul style="list-style-type: none"> ➤ How do you separate metal? ➤ When do you separate metal? ➤ What is machining use for? ➤ Is machining a valuable skill? |
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| <p>Students will: (<i>know</i>) ... (Include vocabulary)</p> <ul style="list-style-type: none"> ➤ Identify the various types of milling machines. ➤ Identify metal separating processes. ➤ Describe how a lathe operates. ➤ Explain how milling machines operate. ➤ Vocabulary: <ul style="list-style-type: none"> ○ Mill - vertical, horizontal, lever, cross-feed, longitudinal feed, XYZ coordinates, face milling, and end milling ○ Lathe – Bed, swing, tool post, automatic feed, lead screw, carriage and tailstock | <p>Students will be able to: (i.e. do) ... (Include vocabulary)</p> <ul style="list-style-type: none"> ➤ Setup and carryout between center turning operations for straight turning (Duty Title 2.3). ➤ Setup and carry out chucking operations for turning (Duty Title 2.4). ➤ Setup and perform squaring up the six surface of a block (Duty Title 2.5). ➤ Setup and operate vertical milling machines. Perform routine milling, and location of hole centers within +/- .005” (Duty Title 2.6). ➤ Operate a mill and lathe safely. ➤ Select, mount, and care for milling cutters. ➤ Prepare machine and mount work for a variety of milling operations. ➤ Sharpen lathe cutting tools. |
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Stage 2 – Assessment Evidence

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| <p>Performance Tasks: (i.e. Assessment used to determine proficiency on competency)</p> <ul style="list-style-type: none"> ➤ Chapter review ➤ Mill project ➤ Lathe project | <p>Key Criteria: (Rubric)</p> <ul style="list-style-type: none"> ➤ Mill project ➤ Lathe project |
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Metals Materials and Processes

Stage 3 – Learning Plan:
Practice machining / separating processes.
Power Benchmark/Competency: #5

| Learning Activities: | Resources: |
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| Chapter review | |
| Mill identification | |
| Lathe identification | |
| Metal separating demonstrations | |
| Safety when separating metal | |
| Mill project | |
| Lathe project | |
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Metals Materials and Processes

Stage 1 – Desired Results:

| <p>Power Standard 3: Students will develop abilities for a technological world in metals, materials, and processes.</p> <p>Power Benchmark/Competency #6: Practice metal casting and forming processes.</p> <p>Estimated Timeline:</p> | <p>Place ‘X’ in square if goal addresses Essential/Content Standard(s).</p> <table border="1" style="width: 100%; text-align: center; border-collapse: collapse;"> <thead> <tr style="background-color: #ffffcc;"> <th style="padding: 2px;">Career</th> <th style="padding: 2px;">Technology</th> <th style="padding: 2px;">Critical Thinking</th> <th style="padding: 2px;">Personal Responsibility</th> <th style="padding: 2px;">Global & Cultural</th> </tr> </thead> <tbody> <tr> <td style="padding: 2px;"></td> <td style="padding: 2px;">X</td> <td style="padding: 2px;"></td> <td style="padding: 2px;">X</td> <td style="padding: 2px;"></td> </tr> <tr style="background-color: #ffffcc;"> <th style="padding: 2px;">Math</th> <th style="padding: 2px;">Science</th> <th style="padding: 2px;">Reading</th> <th style="padding: 2px;">Social Responsibility</th> <th style="padding: 2px;">Communication</th> </tr> <tr> <td style="padding: 2px;"></td> <td style="padding: 2px;"></td> <td style="padding: 2px;"></td> <td style="padding: 2px;"></td> <td style="padding: 2px;"></td> </tr> </tbody> </table> | Career | Technology | Critical Thinking | Personal Responsibility | Global & Cultural | | X | | X | | Math | Science | Reading | Social Responsibility | Communication | | | | | |
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| Math | Science | Reading | Social Responsibility | Communication | | | | | | | | | | | | | | | | | |
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| <p>Understandings: <i>Students will understand that:</i></p> <ul style="list-style-type: none"> ➤ OSHA has outline safety regulations for the foundry. ➤ Casting is the forming of metal objects by pouring molten metal into a mold. ➤ Foundry work is a demanding occupation. ➤ Several products sold in the U.S. are created my sand casting. ➤ Careers are available for foundry work. | <p>Essential Questions:</p> <ul style="list-style-type: none"> ➤ What is done in the foundry? ➤ How do we create molds? ➤ What are molds made for? ➤ What types of products are produced in the foundry? | | | | | | | | | | | | | | | | | | | | |
| <p>Students will: (<i>know</i>) ...(Include vocabulary)</p> <ul style="list-style-type: none"> ➤ Explain the sand casting process. ➤ Identify protective equipment. ➤ Follow proper procedures in foundry. ➤ Define tools used in sand casting. ➤ Vocabulary: <ul style="list-style-type: none"> ○ Creating mold - Green sand, pouring basin, sprue, gate, runner, riser, flask, cope, and drag. ○ Pouring – Crucible, crucible furnace, ladle, molten metal, slag, asbestos sheeting and degassing tablet. | <p>Students will be able to: (i.e. do)...(Include vocabulary)</p> <ul style="list-style-type: none"> ➤ Form flat back pattern and pour casting ➤ Design and create a mold. ➤ Pack a sand casting properly. ➤ Heat and pour molten metal safely. ➤ Follow proper safety in foundry units. ➤ Follow safe casting procedures. | | | | | | | | | | | | | | | | | | | | |

Stage 2 – Assessment Evidence

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| <p>Performance Tasks: (i.e. Assessment used to determine proficiency on competency)</p> <ul style="list-style-type: none"> ➤ Chapter review ➤ Foundry project | <p>Key Criteria: (Rubric)</p> <ul style="list-style-type: none"> ➤ Foundry project rubric |
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Metals Materials and Processes

Stage 3 – Learning Plan:

Practice metal casting and forming processes.

Power Benchmark/Competency: # 6

| Learning Activities: | Resources: |
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| Chapter review units | |
| Foundry demonstration | |
| Sand casting unit | |
| ➤ Demonstrate the correct way to make a sand casting. | |
| ➤ Follow sequential directions when packing sand casting. | |
| ➤ Follow sequential directions when pouring in foundry. | |
| Foundry project | |
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Metals Materials and Processes

Stage 1 – Desired Results:

| <p>Power Standard 3: Students will develop abilities for a technological world in metals, materials, and processes.</p> <p>Power Benchmark/Competency #7: Practice metal combining processes.</p> <p>Estimated Timeline:</p> | <p>Place ‘X’ in square if goal addresses Essential/Content Standard(s).</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #ffffcc;"> <th style="padding: 2px;">Career</th> <th style="padding: 2px;">Technology</th> <th style="padding: 2px;">Critical Thinking</th> <th style="padding: 2px;">Personal Responsibility</th> <th style="padding: 2px;">Global & Cultural</th> </tr> </thead> <tbody> <tr> <td></td> <td style="text-align: center;">X</td> <td></td> <td style="text-align: center;">X</td> <td></td> </tr> <tr style="background-color: #ffffcc;"> <th style="padding: 2px;">Math</th> <th style="padding: 2px;">Science</th> <th style="padding: 2px;">Reading</th> <th style="padding: 2px;">Social Responsibility</th> <th style="padding: 2px;">Communication</th> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> | Career | Technology | Critical Thinking | Personal Responsibility | Global & Cultural | | X | | X | | Math | Science | Reading | Social Responsibility | Communication | | | | | |
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| Career | Technology | Critical Thinking | Personal Responsibility | Global & Cultural | | | | | | | | | | | | | | | | | |
| | X | | X | | | | | | | | | | | | | | | | | | |
| Math | Science | Reading | Social Responsibility | Communication | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| <p>Understandings: <i>Students will understand that:</i></p> <ul style="list-style-type: none"> ➤ OSHA has outline safety regulations for combining processes. ➤ Safety guidelines must be followed when welding. ➤ Several opportunities are available for welding occupations. ➤ Products are assembled by the welding process. | <p>Essential Questions:</p> <ul style="list-style-type: none"> ➤ What are come methods of combining metals? ➤ What is the difference between GMAW and Arc welding? ➤ Are welders needed in the U.S.? ➤ Why do we weld products together? | | | | | | | | | | | | | | | | | | | | |
| <p>Students will: (know) ...(Include vocabulary)</p> <ul style="list-style-type: none"> ➤ Describe the basic welding processes. ➤ Define components of welding station. ➤ Recognize the various weld joints. ➤ Vocabulary: Arc, oxyacetylene, welding positions, shade 10 lens, MIG, and GMAW. | <p>Students will be able to: (i.e. do)...(Include vocabulary)</p> <ul style="list-style-type: none"> ➤ Follow proper safety when welding. ➤ Weld in flat position using GMAW station. ➤ Set up and use GMAW welding station. | | | | | | | | | | | | | | | | | | | | |

Stage 2 – Assessment Evidence

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| <p>Performance Tasks: (i.e. Assessment used to determine proficiency on competency)</p> <ul style="list-style-type: none"> ➤ Chapter review ➤ Welding assignments | <p>Key Criteria: (Rubric)</p> <ul style="list-style-type: none"> ➤ Welding rubric |
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Metals Materials and Processes

Stage 1 – Desired Results:

| <p>Power Standard 3: Students will develop abilities for a technological world in metals, materials, and processes.</p> <p>Power Benchmark/Competency #8: Practice boring / drilling processes.</p> <p>Estimated Timeline:</p> | <p>Place ‘X’ in square if goal addresses Essential/Content Standard(s).</p> <table border="1" style="width: 100%; text-align: center; border-collapse: collapse;"> <thead> <tr style="background-color: #ffffcc;"> <th style="padding: 2px;">Career</th> <th style="padding: 2px;">Technology</th> <th style="padding: 2px;">Critical Thinking</th> <th style="padding: 2px;">Personal Responsibility</th> <th style="padding: 2px;">Global & Cultural</th> </tr> </thead> <tbody> <tr> <td></td> <td style="text-align: center;">X</td> <td></td> <td style="text-align: center;">X</td> <td></td> </tr> <tr style="background-color: #ffffcc;"> <th style="padding: 2px;">Math</th> <th style="padding: 2px;">Science</th> <th style="padding: 2px;">Reading</th> <th style="padding: 2px;">Social Responsibility</th> <th style="padding: 2px;">Communication</th> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> | Career | Technology | Critical Thinking | Personal Responsibility | Global & Cultural | | X | | X | | Math | Science | Reading | Social Responsibility | Communication | | | | | |
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| Career | Technology | Critical Thinking | Personal Responsibility | Global & Cultural | | | | | | | | | | | | | | | | | |
| | X | | X | | | | | | | | | | | | | | | | | | |
| Math | Science | Reading | Social Responsibility | Communication | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| <p>Understandings: <i>Students will understand that:</i></p> <ul style="list-style-type: none"> ➤ OSHA has outline safety regulations for boring and drilling processes. ➤ Essential skill in metalworking. ➤ Drilling is a common practice in a machine shop. | <p>Essential Questions:</p> <ul style="list-style-type: none"> ➤ What was the first machine tool and when was it dated? Drill, 1200 BC. ➤ Why do we use the drill? | | | | | | | | | | | | | | | | | | | | |
| <p>Students will: (<i>know</i>) ... (Include vocabulary)</p> <ul style="list-style-type: none"> ➤ Identify drill size classifications. ➤ Observe drilling safety rules. ➤ Identify various types of drilling machines. ➤ Vocabulary – Boring, and reaming. | <p>Students will be able to: (i.e. do)... (Include vocabulary)</p> <ul style="list-style-type: none"> ➤ Setup and operate drill press. Perform routine press operations (Duty Title 2.8). ➤ Secure all equipment and mount the work solidly. ➤ Read prints, locate center-drill locations and operate the drill press. ➤ Select and safely use the correct drill(s) and drilling machine for a given job. ➤ Make safe setups on a drill press. | | | | | | | | | | | | | | | | | | | | |

Stage 2 – Assessment Evidence

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| <p>Performance Tasks: (i.e. Assessment used to determine proficiency on competency)</p> <ul style="list-style-type: none"> ➤ Chapter review ➤ Boring / drilling project | <p>Key Criteria: (Rubric)</p> <ul style="list-style-type: none"> ➤ Drill press project Rubric |
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Metals Materials and Processes

Stage 1 – Desired Results:

| <p>Power Standard 3: Students will develop abilities for a technological world in metals, materials, and processes.</p> <p>Power Benchmark/Competency #9: Practice CNC (computer numerical control) machining.</p> <p>Estimated Timeline:</p> | <p>Place ‘X’ in square if goal addresses Essential/Content Standard(s).</p> <table border="1" style="width: 100%; text-align: center; border-collapse: collapse;"> <thead> <tr style="background-color: #ffffcc;"> <th style="padding: 2px;">Career</th> <th style="padding: 2px;">Technology</th> <th style="padding: 2px;">Critical Thinking</th> <th style="padding: 2px;">Personal Responsibility</th> <th style="padding: 2px;">Global & Cultural</th> </tr> </thead> <tbody> <tr> <td></td> <td style="text-align: center;">X</td> <td></td> <td style="text-align: center;">X</td> <td></td> </tr> <tr style="background-color: #ffffcc;"> <th style="padding: 2px;">Math</th> <th style="padding: 2px;">Science</th> <th style="padding: 2px;">Reading</th> <th style="padding: 2px;">Social Responsibility</th> <th style="padding: 2px;">Communication</th> </tr> <tr> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> | Career | Technology | Critical Thinking | Personal Responsibility | Global & Cultural | | X | | X | | Math | Science | Reading | Social Responsibility | Communication | X | | | | |
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| Career | Technology | Critical Thinking | Personal Responsibility | Global & Cultural | | | | | | | | | | | | | | | | | |
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| Math | Science | Reading | Social Responsibility | Communication | | | | | | | | | | | | | | | | | |
| X | | | | | | | | | | | | | | | | | | | | | |
| <p>Understandings: <i>Students will understand that:</i></p> <ul style="list-style-type: none"> ➤ OSHA has outline safety regulations for the use of CNC machines. ➤ Mathematical skills are essential when CNC machining. ➤ Industry’s technology advancements have created opportunities with CNC skilled workers. ➤ Many products in the world are produced my CNC machining. | <p>Essential Questions:</p> <ul style="list-style-type: none"> ➤ What are some modern machining practices? ➤ What does CNC stand for? ➤ Why would you use CNC machines instead of manual machines? ➤ What are some careers in CNC Machining? | | | | | | | | | | | | | | | | | | | | |
| <p>Students will: (<i>know</i>) ...(Include vocabulary)</p> <ul style="list-style-type: none"> ➤ Use coordinate geometry to solve problems involving symmetry and transformations of figures. ➤ Identify coding systems. ➤ Define automation and its application in manufacturing. ➤ Explain different methods of controlling machine tools. ➤ Define terminology that applies to modern machining processes. ➤ Vocabulary: NC machining, CNC machining, XYZ coordinates, absolute coordinates, CAD/CAM, N, G, M, and F codes. | <p>Students will be able to: (i.e. do)...(Include vocabulary)</p> <ul style="list-style-type: none"> ➤ Using the principles of Cartesian coordinates develop a program for the manufacture of a simple part (Duty Title 2.9). ➤ Develop knowledge of basic word address programming codes, and Cartesian Coordinates. Understand incremental and absolute positioning and cutter compensation (KSAO 8.1). ➤ Write CNC programs. ➤ Design parts using CAD/CAM software. ➤ Machining a part using shop CNC machine . ➤ Compare manual machining to automated machining. ➤ Design parts using CAD/CAM software. ➤ Practice proper safety and using modern machining equipment. | | | | | | | | | | | | | | | | | | | | |

Stage 2 – Assessment Evidence

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| <p>Performance Tasks: (i.e. Assessment used to determine proficiency on competency)</p> <ul style="list-style-type: none"> ➤ Write CNC programs ➤ Design parts using software ➤ CNC machining ➤ CNC exam | <p>Key Criteria: (Rubric)</p> <ul style="list-style-type: none"> ➤ CNC rubric |
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Metals Materials and Processes

Stage 3 – Learning Plan:

Practice CNC (computer numerical control) machining.

Power Benchmark/Competency: #9

| Learning Activities: | Resources: |
|-----------------------------|-------------------|
| CNC lecture | |
| CNC demonstrations | |
| CNC worksheets | |
| Write CNC programs | |
| Design parts using software | |
| CNC machining | |
| CNC exams | |
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Metals Materials and Processes

Stage 1 – Desired Results:

| <p>Power Standard 1: Students will develop an understanding of the nature of metalworking technology.</p> <p>Power Benchmark/Competency #10: Discover metalworking careers and career planning strategies.</p> <p>Estimated Timeline:</p> | <p>Place ‘X’ in square if goal addresses Essential/Content Standard(s).</p> <table border="1" style="width: 100%; text-align: center; border-collapse: collapse;"> <thead> <tr style="background-color: #ffffcc;"> <th style="padding: 2px;">Career</th> <th style="padding: 2px;">Technology</th> <th style="padding: 2px;">Critical Thinking</th> <th style="padding: 2px;">Personal Responsibility</th> <th style="padding: 2px;">Global & Cultural</th> </tr> </thead> <tbody> <tr> <td style="padding: 2px;">X</td> <td style="padding: 2px;">X</td> <td style="padding: 2px;">X</td> <td style="padding: 2px;">X</td> <td style="padding: 2px;"></td> </tr> <tr style="background-color: #ffffcc;"> <th style="padding: 2px;">Math</th> <th style="padding: 2px;">Science</th> <th style="padding: 2px;">Reading</th> <th style="padding: 2px;">Social Responsibility</th> <th style="padding: 2px;">Communication</th> </tr> <tr> <td style="padding: 2px;"></td> <td style="padding: 2px;"></td> <td style="padding: 2px;">X</td> <td style="padding: 2px;"></td> <td style="padding: 2px;"></td> </tr> </tbody> </table> | Career | Technology | Critical Thinking | Personal Responsibility | Global & Cultural | X | X | X | X | | Math | Science | Reading | Social Responsibility | Communication | | | X | | |
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| Math | Science | Reading | Social Responsibility | Communication | | | | | | | | | | | | | | | | | |
| | | X | | | | | | | | | | | | | | | | | | | |
| <p>Understandings: <i>Students will understand that:</i></p> <ul style="list-style-type: none"> ➤ There is a relationship between educational achievement and career success. ➤ Decision-making skills to career planning and course selection help career transition. ➤ Employers and employees have realistic expectations. | <p>Essential Questions:</p> <ul style="list-style-type: none"> ➤ Define the term technology. ➤ What careers are available in metalworking? ➤ What is important to you when selecting a career? ➤ Is there a relationship between educational success and career success? | | | | | | | | | | | | | | | | | | | | |
| <p>Students will: (<i>know</i>) ... (Include vocabulary)</p> <ul style="list-style-type: none"> ➤ List the types of careers available in metalworking industry. ➤ Vocabulary: Unskilled, semiskilled and skilled workers. <ul style="list-style-type: none"> ○ Examples – Tool & die maker, millwright, machinist, welder, blacksmith, goldsmith, silversmith, and metallurgist. ➤ Explain how to enter the workforce and get a job in the metalworking industry. | <p>Students will be able to: (i.e. do) ... (Include vocabulary)</p> <ul style="list-style-type: none"> ➤ Compare careers in related fields. ➤ Identify what industry expects of an employee. ➤ Develop and explain a short-term career plan and resume (Duty 7.1). ➤ Complete job application form and demonstrate interviewing skills (Duty Title 7.2). | | | | | | | | | | | | | | | | | | | | |
| <h2 style="margin: 0;">Stage 2 – Assessment Evidence</h2> | | | | | | | | | | | | | | | | | | | | | |
| <p>Performance Tasks: (i.e. Assessment used to determine proficiency on competency)</p> <ul style="list-style-type: none"> ➤ Chapter review ➤ Career/ job search process ➤ Write a resume | <p>Key Criteria: (Rubric)</p> <ul style="list-style-type: none"> ➤ Career research rubric | | | | | | | | | | | | | | | | | | | | |

Metals Materials and Processes

Stage 3 – Learning Plan:

Discover metalworking careers and career planning strategies.

Power Benchmark/Competency: # 10

| Learning Activities: | Resources: |
|--|-------------------|
| Chapter review | |
| Classroom discussion | |
| ➤ Explain how various types of technology contribute to advances in industry | |
| ➤ Employee/ employer expectations | |
| ➤ Career/ job search process | |
| Write resume | |
| Career research project | |
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