Course Information
Division: Industrial Technology Education
Course Number: WLD 201
Title: Repair Welding and Fabrication
Credits: 3
Developed by: Carlton Penn
Lecture/Lab Ratio: 1 Lecture/4 Lab
Transfer Status:

<table>
<thead>
<tr>
<th></th>
<th>ASU</th>
<th>NAU</th>
<th>UA</th>
</tr>
</thead>
<tbody>
<tr>
<td>MET Dept Elective</td>
<td>CTE Departmental Elective</td>
<td>Non Transferable</td>
<td></td>
</tr>
</tbody>
</table>

Activity Course: No
CIP Code: 48.0508
Assessment Mode: Pre/Post Test (20 Questions/100 Points)
Semester Taught: Fall
GE Category: None
Separate Lab: No
Awareness Course: No
Intensive Writing Course: No

Prerequisites:
WLD 101 or WLD 108 or instructor approval

Educational Value
A. To General Education: To reinforce and use basic academic skills learned in general education classes.
B. To Vocational Education: To develop analytical and hand skills necessary to pursue a vocational area of interest.
C. To Other Course Work: To act as a building block for other courses of study in the Phelps Dodge Plant Maintenance field.

Description
This course covers the safe and efficient use of welding tools and techniques to repair and maintain industrial machinery. The course emphasizes the fabrication of guards and brackets, welding of dissimilar metals, structural welding, out-of-position welding, MIG welding, SMAW welding, air arc welding, various grinding and cutting tools, shears, breaks, and rollers.
Supplies
None

Competencies and Performance Standards

1. Operate all of the welding shop equipment in a safe and careful manner.

   Learning objectives
   What you will learn as you master the competency:
   a. List all of the safety rules which apply to the welding shop.
   b. Understand situations which produce specific hazards in the welding environment.
   c. Identify the causes of accidents in case studies.
   d. Develop the habits of working safely in all situations.

   Performance Standards
   Competence will be demonstrated:
   o in lab assignments
   Criteria - Performance will be satisfactory when:
   o learner works safely and uses appropriate safety gear with each piece of welding equipment
   o learner sets up all of the welding equipment correctly for the required conditions
   o learner operates all of the welding equipment safely
   o learner uses all appropriate safety procedures while using welding and cutting equipment

2. Operate the O-A cutting torch and plasma torch to produce accurate cuts in metal projects.

   Learning objectives
   What you will learn as you master the competency:
   a. Diagram the cutting processes and explain how they work.
   b. List the components of an ox-acetylene cutting torch and explain how they work.
   c. List the components of a plasma torch and explain how they work.
   d. Demonstrate the proper cutting techniques using O-A and plasma arc cutting.

   Performance Standards
   Competence will be demonstrated:
   o in lab assignments
   Criteria - Performance will be satisfactory when:
   o learner installs components and adjusts each piece of cutting equipment correctly
   o learner makes precise and accurate cuts on different thicknesses and shapes of metal using the oxy-acetylene torch, the plasma cutter, the arc-air torch, the power shear, the iron worker, the horizontal band saw and the abrasive cut off saw
   o learner produces a minimum of waste in the cutting process
3. **Prepare edges and joints for effective weld procedures.**

   **Learning objectives**
   What you will learn as you master the competency:
   a. Explain the reasons for proper edge joint preparation.
   b. Diagram different edge joint preparation for a variety of welded joints.
   c. List the reasons for joint spacing in square butt joints.
   d. Demonstrate the increased strength of a welded joint which occurs when proper edge joint preparation has taken place.

   **Performance Standards**
   Competence will be demonstrated:
   - in lab activities and assignments

   **Criteria - Performance will be satisfactory when:**
   - learner demonstrates correct use of the O-A torch for proper beveling and scarfing
   - learner demonstrates the correct use of the horizontal band saw and the iron worker for edge preparation
   - learner prepares 5 basic weld joints with correct edge preparation

4. **Demonstrate the ability to use layout and sheet metal tooling/equipment correctly.**

   **Learning objectives**
   What you will learn as you master the competency:
   a. Understand the process of layout.
   b. Understand the process of shearing.
   c. Understand the process of notching.
   d. Understand the process of forming.
   e. Understand the process of spot-welding.

   **Performance Standards**
   Competence will be demonstrated:
   - in lab activities

   **Criteria - Performance will be satisfactory when:**
   - learner creates the project to comply with dimensional drawing and industry standard of workmanship
   - learner demonstrates the correct use of the horizontal band saw and the iron worker for edge preparation
   - learner prepares 5 basic weld joints with correct edge preparation

5. **Demonstrate the agility to use plasma cutting equipment to fabricate projects from dimensional drawings.**

   **Learning objectives**
   What you will learn as you master the competency:
   a. Describe plasma.
   b. Describe how plasma cutting torch works.
   c. Describe the advantages and disadvantages of using a plasma cutting torch.
d. Describe how to set and use a plasma cutting torch.

**Performance Standards**

*Competence will be demonstrated:*

- in lab activities
- in written assignments

*Criteria - Performance will be satisfactory when:*

- learner can demonstrate the correct procedures for preparing plasma cut parts.
- learner can demonstrate the correct procedures for setting up and adjusting the settings on a plasma arc cutting machine on required projects.

6. **Select the proper electrodes for various welding applications on assigned projects.**

**Learning objectives**

*What you will learn as you master the competency:*

a. Describe the importance of tensile strength in choosing electrodes.

b. List the ingredients in stick welding electrode coatings.

c. Explain the difference between fast fill and fast freeze electrodes.

d. Show which electrodes can be used in all positions.

e. Demonstrate the effectiveness of low hydrogen electrodes in welding new steel.

**Performance Standards**

*Competence will be demonstrated:*

- in lab activities

*Criteria - Performance will be satisfactory when:*

- learner lists the criteria for selecting electrodes
- learner describes the advantages and disadvantages of each electrode
- learner chooses the correct electrode for each assigned lab project

7. **Produce sound welds in vertical and overhead positions using arc welding equipment.**

**Learning objectives**

*What you will learn as you master the competency:*

a. Recognize the appearance and the sound of a good weld as it progresses

b. Manipulate the welding rod or torch to produce maximum penetration and good weld beads.

c. Produce good sound welds with various rods and arc welding machines or O-A torches.

**Performance Standards**

*Competence will be demonstrated:*

- in lab activities

*Criteria - Performance will be satisfactory when:*

- learner identifies all of the components of various welding machines
- learner lists the advantages and disadvantages of each type of arc welding machine
- learner sets up the arc welder correctly for each job
- learner manipulates the electrode holder and the rod to produce sound welds in the vertical and overhead positions
8. Set up and operate the drill press and radial drill to produce specified hole dimensions in assigned projects.

**Learning objectives**

What you will learn as you master the competency:

a. Identify the different types of drilling machines and describe their use.

b. Identify the different tools which are commonly used in drill press operations.

c. Demonstrate the correct method for installing and removing cutting tools in different drilling machines.

d. List the parts of a drill.

**Performance Standards**

Competence will be demonstrated:

- in lab activities and assignments

Criteria - Performance will be satisfactory when:

- learner identifies the following drilling equipment and describes the advantages and limitations of each: drill press, radial drill, hand drill

- learner identifies the different types of tooling used in machine shop drilling machines

- learner chooses the correct drilling tools for various projects

- learner correctly sets up spindle speeds and work clamping devices for each job

**Types of Instruction**

Lecture/Discussion

Field Trip

Instructor Demonstration

**Grading Information**

**Grading Rationale**

Class - 50%

All tests equal in weight. Reports and unit questions will equal one test in weight. Post test will equal other tests in weight and will be 10% of the final grade.

Laboratory - 50%

Welding project will equal 1/3 of lab grade. Sheet metal project will equal 1/3 of lab grade. Attendance will equal 1/3 of lab grade.

**Grading Scale**

A 90% - 100%

B 80% - 89%

C 70% - 79%

D 60% - 69%

F Below 60%