

Blacksmithing and Fabricating

Course Design

2005-2006

Course Information

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| Organization | EASTERN ARIZONA COLLEGE |
| Division | Industrial Technology Education |
| Course Number | MSP 115 |
| Title | Blacksmithing and Fabricating |
| Credits | 2 |
| Developed by | Karlinsey-Dryden |
| Lecture/Lab Ratio | 1 Lecture/3 Lab |
| Transfer Status | Non-transferable |
| Activity Course | Yes |
| CIP Code | 48.0500 |
| Assessment Mode | Pre/Post Test (20 Questions/ 32 Points) |
| Semester Taught | Upon Request |
| GE Category | None |
| Separate Lab | No |
| Awareness Course | No |
| Intensive Writing Course | No |

Prerequisites

None

Description

This is a course in forging, casting, welding, brazing, hot metal forming, heat treating and layout and design of metal parts and projects. Students will learn how to perform tasks required for metal fabricating for the production of completed metal projects.

Supplies

Safety glasses

Competencies and Performance Standards

1. Operate all shop equipment and use all shop tools in a safe and effective manner.

Learning objectives

What you will learn as you master the competency:

- a. Identify the causes of accidents in a welding and forge shop .
- b. List the safety equipment which must be utilized in this shop.
- c. Describe the rules of safety appropriate for all of the tools and equipment used in the welding and forge areas.
- d. List the major components of all welding and cutting equipment, and install correctly.
- e. Identify the parameters and conditions for setting and adjusting welding and cutting equipment.
- f. Give examples of six basic welding joints.
- g. Describe the chemical and mechanical processes that occur in all of the cutting operations.
- h. Demonstrate the techniques of welding using stick, MIG, TIG and O-A methods.

Performance Standards

Competence will be demonstrated:

- o in the safe and effective use of shop tools and equipment.
- o by completing assigned projects.

Criteria - Performance will be satisfactory when:

- o learner works safely and uses appropriate safety gear with each piece of welding and forging equipment.
- o learner installs components of all systems correctly.
- o learner adjusts and sets up and adjust all of the equipment correctly for each working situation.
- o learner produces assigned projects by effectice use of shop tools and equipment.

2. Apply accepted methods of project development and layout procedures.

Learning objectives

What you will learn as you master the competency:

- a. Describe the layout process.
- b. List the elements and features of a good layout.
- c. Measure all components correctly.
- d. Interpret the drawing symbols correctly.
- e. Calculate all layout dimensions accurately.

Performance Standards

Competence will be demonstrated:

- o In the completion of assigned layout projects.
- o By producing a project with all layout features complete.

- o By producing a layout with all dimensions accurately represented.

Criteria - Performance will be satisfactory when:

- o learner uses layout instruments and equipment to make accurate layouts on assigned projects.
- o learner measures all dimensions accurately.
- o learner interprets drawings and layout features correctly
- o learner calculates centers, tangent points, angles, and coordinate positions accurately.

3. Cut and prepare welding joints and reinforcing members.

Learning objectives

What you will learn as you master the competency:

- a. Describe the methods of accurate cutting
- b. List the criteria for choosing a cutting or burning method.
- c. List the criteria for choosing each type of weld joint design.
- d. Identify the different types of reinforcing members used in weldments.
- e. Choose a type of reinforcing member for each selected weldment.

Performance Standards

Competence will be demonstrated:

- o by using shop burning and cutting equipment to produce parts for assigned projects.
- o by preparing all weld joints effectively for good welds
- o by preparing reinforcing members for assigned projects.

Criteria - Performance will be satisfactory when:

- o learner cuts components of assigned projects to specifications.
- o learner prepares welding joints for the welding process by grooving, beveling and scarfing correctly.
- o learner correctly makes and prepares reinforcing members for assigned projects.

4. Select welding electrodes and other welding expendables correctly.

Learning objectives

What you will learn as you master the competency:

- a. Identify the various welding electrodes.
- b. State the application of each different type of welding electrode.
- c. Define the important characteristics of each welding filler rod used in O-A welding and TIG welding.
- d. Describe the different types of electrode coatings and their properties.
- e. List the advantages and disadvantages of each different type of electrode.
- f. Match the different welding rod specifications to the different electrodes.
- g. Choose the correct MIG wire for different welding situations.
- h. List the reasons, advantages and disadvantages for choosing a flux cored wire welding

- operation.
- i. Describe the parameters for setting up a flux cored wire welding operation.
 - j. Describe the advantages and disadvantages of each of the shielding gasses normally used for welding.

Performance Standards

Competence will be demonstrated:

- o In the process of arc welding on various welding projects.
- o In the completion of assigned tasks at the O-A welding station.
- o As the student sets up the MIG and TIG equipment to complete assigned exercises.

Criteria - Performance will be satisfactory when:

- o learner uses the correct electrode for each arc welding process.
- o learner uses the correct filler rod for each O-A welding process.
- o learner uses the correct feed wire for each MIG welding process.
- o learner selects the correct shielding gasses for MIG and TIG welding processes.

5. Demonstrate proper methods of welding various metals.

Learning objectives

What you will learn as you master the competency:

- a. Demonstrate the correct procedures and techniques for producing sound welds.
- b. Describe the parameters and conditions for choosing each type of welding.
- c. Select the machine settings required by various welding tasks.
- d. Diagram the different weaving and whipping techniques of arc welding.
- e. Show the correct procedures for producing sound welds.
- f. Describe the procedures which will produce the best welds in each of the following materials: mild steel, high carbon steel, stainless steel, cast iron, aluminum, brass and bronze.
- g. Illustrate all of the procedures currently used for production welding.
- h. Demonstrate the procedures required for butt, groove, fillet, flange, and pipe welding.

Performance Standards

Competence will be demonstrated:

- o Using the arc welding equipment in the EAC welding shop.
- o In the completion of assigned projects in the welding shop.
- o In the completion of a chapter test

Criteria - Performance will be satisfactory when:

- o learner produces sound welds on assigned projects.
- o learner selects the proper equipment for each assigned task.
- o learner adjusts the equipment correctly for each job condition.
- o learner produces sound welds in a variety of job situations
- o learner displays skill in assigned welding tasks

6. Practice procedures to minimize and remove distortion in metal projects.

Learning objectives

What you will learn as you master the competency:

- a. List the factors that cause distortion in welding.
- b. List effects on a weldment caused by distortion
- c. Describe the methods which can be used to minimize distortion in welding.
- d. Describe the methods that can be used to repair a weldment that has been distorted in welding.

Performance Standards

Competence will be demonstrated:

- o by welding on assigned projects.
- o by selecting welding equipment, electrodes, and tools appropriate for the assigned tasks.
- o in the completion of a chapter test.

Criteria - Performance will be satisfactory when:

- o learner demonstrates the ability to place tack welds to effectively control shrinkage.
- o learner uses welding jigs correctly to control distortion.
- o learner selects electrodes which will effectively minimize distortion.
- o learner demonstrates welding techniques which will effectively minimize distortion.

7. Use forging tools and equipment to produce assigned projects

Learning objectives

What you will learn as you master the competency:

- a. Describe The features of different foundry tools and name their strong points.
- b. Describe the process of plastic deformation that occurs in forging operations.
- c. Describe the process of oxidation as it applies to hot metals.
- d. List the defects that can occur in forging operations and describe methods of prevention.
- e. Describe the effect that increased carbon content in steel has on the forging process.
- f. Explain the process of forge welding.

Performance Standards

Competence will be demonstrated:

- o in the selection of the forging tools to be used for each task.
- o by firing the forge and heating the materials correctly.
- o In the completion of the assigned projects with good workmanship.
- o by showing the correct procedures for setting up the bender and producing accurate bends.

Criteria - Performance will be satisfactory when:

- o learner uses all of the forging tools correctly.
- o learner prepares projects for forming, shaping, and forging correctly
- o learner uses the forge with a minimum of oxidation in steel parts.

- o learner completes assigned projects with accuracy and efficiency.

8. Demonstrate proper heat treating procedures for hardening, annealing and stress relieving.

Learning objectives

What you will learn as you master the competency:

- a. Diagram the crystal structure of steel at various temperatures.
- b. Describe effects of various quenching media on high carbon steel.
- c. List the steps for turning on, operating and shutting down the forge and the heat treating furnace.
- d. Describe the processes of heating, quenching and tempering to produce a through hardness in steel.
- e. List the steps in case hardening a low carbon steel part by carburizing.
- f. Student will explain the process of annealing and tell how the process will vary according to the carbon content.
- g. Calculate the time temperature differentials for stress relieving a weldment.

Performance Standards

Competence will be demonstrated:

- o Using the welding, heating and quenching equipment in the EAC welding shop.
- o In the completion of assigned tasks for each heat treating operation.

Criteria - Performance will be satisfactory when:

- o learner operates the furnace and other heat treating equipment correctly.
- o learner hardens and tempers high carbon steel with maximum through hardness.
- o learner carburizes and case hardens a part made of low carbon mild steel.
- o learner Anneals steels of different hardness and carbon content.
- o learner calculates the stress relieving parameters and performs the operation.

Types of Instruction

Lecture

Lab

Grading Information

Grading Rationale

Students will be graded on four items outlined as follows:

- 20% Average of four quizzes with the lowest score removed.
- 40% Projects completed in the lab.
- 30% Comprehensive final exam
- 10% Attendance

Grading Scale

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| A | 90% TO 100% |
| B | 80 to 89% |
| C | 70 to 79% |
| D | 59 to 69% |
| F | Below 59% |