

Technical Welding

Course Design

2005-2006

Course Information

Organization	EASTERN ARIZONA COLLEGE
Division	Industrial Technology Education
Course Number	MSP 210
Title	Technical Welding
Credits	2
Developed by	Karlinsey-Dryden
Lecture/Lab Ratio	1 Lecture/3 Lab
Transfer Status	DEC (VTE) to NAU, NT to ASU and UofA
Activity Course	Yes
CIP Code	48.0500
Assessment Mode	Pre/Post Test (25 Questions/25 Points)
Semester Taught	Fall and Spring
GE Category	None
Separate Lab	No
Awareness Course	No
Intensive Writing Course	No

Prerequisites

MSP 110 or concurrent enrollment in MSP 110 or instructor approval

Educational Value

This course will develop an understanding of the manufacturing and industrial maintenance techniques and the welders job environment. This course will help develop skills necessary to become a professional welder and provide a basic understanding of related occupations. Students will learn technical details, knowledge and skills which can lead to a lifelong interest.

Description

This course includes practice in advanced arc welding techniques in all positions. MIG, TIG, plasma arc, pattern burning, and flame cutting equipment are all used. Emphasis is placed on preparing the student to take the AWS welding certification test.

Supplies

All supplies are furnished by the department

Competencies and Performance Standards

1. Operate all shop welding equipment safely and effectively.

Learning objectives

What you will learn as you master the competency:

- a. List all of the safety rules which apply in the welding shop.
- b. Be alert to situations which produce specific hazards in the welding environment.
- c. Identify the causes of accidents in case studies and describe a procedure which would have eliminated these accidents.
- d. Develop the habits of working safely in all situations.

Performance Standards

Competence will be demonstrated:

- o on the welding equipment in the EAC welding shop.
- o Students will have free access to all tools and safety devices.

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 welding conditions.

2. Select the best welding process for each assigned welding job.

Learning objectives

What you will learn as you master the competency:

- a. Describe all of the commonly used welding processes.
- b. List the advantages and limitations of each of these processes.
- c. Decide which process should be used for each job on a list of carefully described welding situations.
- d. Specify the welding materials, electrodes, filler metals, and welding gases to be used in each of the preceding welding situations.

Performance Standards

Competence will be demonstrated:

- o All written tests will be conducted without student access to text or notes
- o Students will have free access to shop reference materials when fabricating projects.
- o All of the projects will be fabricated in the EAC welding shop.
- o All of the assigned projects will be completed before the end of the semester.

Criteria - Performance will be satisfactory when:

- o learner will identify each type of welding equipment by achieving 80% or better on a written test.
- o learner will list the major advantages and disadvantages of each type of welding unit.
- o learner will choose the correct process and for assigned projects.
- o learner will select the appropriate electrodes and other expendable materials for assigned projects.

3. Produce high quality precision welds in steel, stainless steel and cast iron, using stick arc welding methods.

Learning objectives

What you will learn as you master the competency:

- a. Evaluate the quality of a series of welded joints by visual inspection.
- b. Using fast freeze and low hydrogen electrodes produce sound welds in steel plate.
- c. Using cast iron and nickel rod produce sound welds in iron castings.
- d. Using 300 series stainless steel electrodes produce sound welds in stainless steel.

Performance Standards

Competence will be demonstrated:

- o All welding will take place in the EAC welding shop using shop welding equipment.
- o Students will have access to all tools, equipment, and shop reference materials.

Criteria - Performance will be satisfactory when:

- o learner will produce groove welds which are free of defects.
- o learner will recognize weld defects and list their causes.
- o learner will effectively weld steel, stainless steel, and cast iron using GSAW methods.

4. Produce high quality welds in steel plates in all positions.

Learning objectives

What you will learn as you master the competency:

- a. Describe the difficulties which occur when welding in the overhead and vertical positions.
- b. List the techniques which can be use to overcome these difficulties.
- c. Demonstrate the machine settings which should be used for out of position welding operations.
- d. Demonstrate the procedures for welding in the vertical, horizontal and overhead positions.

Performance Standards

Competence will be demonstrated:

- o In the EAC welding shop using arc welding equipment.
- o Students will have free access to all arc welding machines, tools and shop reference materials.

Criteria - Performance will be satisfactory when:

- o learner will complete three welding plates in the horizontal position.
- o learner will complete three welding plates in the vertical position.
- o learner will complete three welding plates in the overhead position.

5. Produce high quality welds using the MIG process.

Learning objectives

What you will learn as you master the competency:

- a. Describe the spray transfer, globular transfer, and short arc MIG processes.
- b. Define the parameters of MIG welding and explain the proper machine settings for different welding conditions.
- c. List the different types of filler wire which are available and describe their proper application.
- d. Demonstrate the procedures for MIG welding on both sheet metal and heavy plate.
- e. Evaluate the strength of the MIG welded joint by visual inspection.

Performance Standards

Competence will be demonstrated:

- o In the EAC welding shop using MIG welding equipment.
- o Students will have free access to MIG machines, shop tools, and shop reference materials.
- o Students will be given materials for assigned projects.
- o Students will be asked to complete a series of projects.

Criteria - Performance will be satisfactory when:

- o learner effectively uses wire feed welding machines to complete assigned projects.
- o learner demonstrates correct machine settings for specific weld conditions.
- o learner demonstrates the correct methods for installing MIG wire, rollers, and torch tip components.

6. Produce high quality welds using the TIG welding process.

Learning objectives

What you will learn as you master the competency:

- a. Describe the tungsten inert gas welding process.
- b. Diagram the process and list all of the major components of the TIG system.
- c. Set up the TIG machine and gas flow regulator correctly for different welding conditions.
- d. Demonstrate the correct preparation of the tungsten electrode for different welding materials.
- e. TIG weld a stainless steel sheet metal joint with no filler rod.
- f. Produce a sound TIG weld in aluminum.

Performance Standards

Competence will be demonstrated:

- o In the EAC welding shop using TIG welding equipment.
- o Students will have free access to all shop equipment, tools, and reference materials.
- o Students will be given assigned projects to complete.

Criteria - Performance will be satisfactory when:

- o learner will demonstrate the correct procedures for preparing a tungsten electrode.
- o learner will demonstrate the correct procedures for assembling a TIG torch.
- o learner will demonstrate the correct procedures for setting up and adjusting the settings on a TIG arc welding machine for the assigned project.
- o learner manipulates torch and filler rod to produce quality welds in aluminum and steel

7. Practice standard shop procedures to minimize distortion in arc welding.

Learning objectives

What you will learn as you master the competency:

- a. Describe the causes of distortion in welding of all kinds.
- b. List the procedures which can be used to minimize the distortion.
- c. Show the application of tack welds and welding fixtures to minimize distortion.
- d. Demonstrate peening techniques which can be used to reduce distortion in a weld.

Performance Standards

Competence will be demonstrated:

- o using the welding equipment in the EAC welding shop.
- o Students will complete written tests without using text, notes or other reference materials.
- o Students will have free access to welding equipment, shop tools and shop reference materials while working on assigned projects.

Criteria - Performance will be satisfactory when:

- o learner demonstrates the correct placement of tack welds to prepare for thorough welding and minimize distortion.
- o learner will build a welding fixture that will effectively control distortion in a Tee welded segment.
- o learner will demonstrate the correct use of electrodes to minimize distortion.
- o learner effectively use pre and post heating, peening and back stepping techniques in completing assigned projects.

8. Demonstrate welding test methods.

Learning objectives

What you will learn as you master the competency:

- a. Describe the procedures which are commonly used to test welds.
- b. Evaluate the strength of a weld by tensile testing.
- c. Evaluate the strength of a weld by clip tests, and by burning through the weld joint.
- d. Apply the guided bend test to welded test coupons.
- e. Prepare a weld plate to be sent off for x-ray testing.
- f. List the items to be aware of in visual inspection of a weld.

Performance Standards

Competence will be demonstrated:

- o Written tests will be taken without the use of reference materials.
- o Test coupons will be prepared in the EAC welding shop with free access to all tools and shop reference materials
- o Identification of weld defects will take place on prepared weld samples presented by the instructor.
- o Penetrant inspection will take place on student welded tee joints using DYKEM penetrant and developers.

Criteria - Performance will be satisfactory when:

- o learner will prepare test coupons according to AWS specifications.
- o learner will describe the appearance of a sound weld.
- o learner will identify defects in weld samples.
- o learner will demonstrate an ability to use the guided bend tester correctly.
- o learner will identify defects in x-ray plates of welded samples.
- o learner will use penetrant inspection methods to identify hidden flaws

Types of Instruction

Lecture

Lab

Grading Information

Grading Scale

- A 90% to 100% of total points on tests and projects
- B 80% to 89% of total points
- C 70% to 79% of total points
- D 59% to 69% of total points
- F Less than 59% of total points