

Advanced Level Welding

Outline of Instruction

Course Information

Project Type	Course
Organization	Monroe County Community College
Developer	Ed Baltrip
Development Date	1/2013
Course Number	WELD-215, Advanced Level Welding
Instructional Level	Associate Degree
Instructional Area	Welding Technology
Division	Applied Science and Engineering Technology
Contact Hours	250
Total Credits	12

Course Description

This course deals primarily with vertical up, fixed position pipe welding on a multitude of pipe diameters and pipe thicknesses. Emphasis is placed on fit-up preparation, code making organizations and standards, and destructive/non-destructive pipe welding tests.

Major Units:

1. Safety & Health
2. Welding Terms & Definitions
3. Drawing & Welding Symbols
4. Thermal Cutting
5. Layout & Fitup
6. Welding Inspection & Testing
7. Weldability of Metals
8. Codes & Standards
9. NDE Testing
10. Pipe Practices
11. GMAW
12. FCAW
13. SMAW
14. GTAW

Prerequisites

WELD-115, Entry Level Welding; or Deans discretion

Types of Instruction

Instruction Type	Contact Hours	Credits
Instruction for this course will include but will not be limited to, demonstration and lab.	250	12

Program Outcomes

- A. Demonstrate safe welding and thermal cutting practices.
- B. Perform cutting procedures using plasma and oxy-fuel techniques.

- C. Follow procedures to deposit sound welds using Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW), Flu Cored Arc Welding (FCAW), and Gas Metal Arc Welding (GTAW) processes.
- D. Describe American Welding Society (AWS) standards as well as industrial standards as they relate to welding.
- E. Identify and solve common weldability problems.
- F. Demonstrate the proper use and care of common welding equipment.
- G. Identify weld defects, explain methods to prevent defects and demonstrate proper defect repair.
- H. Read prints and interpret welding symbols.
- I. Explain knowledge of basic material and welding metallurgy.

Course Outcomes

OCCUPATIONAL ORIENTATION

UNIT 1: INTRODUCTION TO SHOP EQUIPMENT

1. Follow safe operating procedures
2. Select shop equipment
3. Set up shop equipment
4. Operate shop equipment
5. Operate lifting equipment

LAYOUT & FITUP

UNIT 2: MEASUREMENT FOR LAYOUT

1. Layout parts using advanced layout practices

UNIT 3: LAYOUT TOOLS FOR GEOMETRIC CONSTRUCTION

1. Follow safe handling procedures
2. Select layout tools

UNIT 4: LAYOUT PRINCIPLES AND PRACTICES

1. Interpret drawing, sketch or specification information
2. Prepare work area for layout.
3. Prepare material list
4. Select materials
5. Layout materials

UNIT 5: PART PREPARATIONS – CUTTING & FORMING

1. Perform bending or forming operations.
2. Perform drilling & boring operations
3. Perform shearing operations
4. Perform oxyfuel gas cutting, beveling & piercing operations
5. Perform carbon arc cutting, beveling & piercing operations

UNIT 6: FITUP PRINCIPLES & PRACTICES

1. Fitup parts and assemble

WELDING INSPECTION

UNIT 1: WELDING CODES & OTHER STANDARDS

1. Locate essential welding information from a code or other standard

UNIT 2: QUALIFICATIONS & CERTIFICATIONS

1. Locate essential info for welding procedure & performance qualifications

WELDING METALLURGY

1. Recognize fundamental principles related to welding metallurgy.
2. Recognize fundamental principles related to the properties of metals
3. Recognize fundamental principles related to residual stress & distortion

WELDING INSPECTION & TESTING PRINCIPLES

UNIT 1: WELDING INSPECTION & TESTING

1. Recognize the role of welding inspection & testing in industry

UNIT 2: VISUAL EXAMINATION PRINCIPLES & PRACTICES

1. Examine cut surfaces and edges of prepared base metal parts
2. Examine tack, intermediate layers and completed welds

ARC WELDING PRINCIPLES & PRACTICES

UNIT 1: SHIELDED METAL ARC WELDING SMAW

1. Perform safety inspections of equipment & accessories
2. Make minor external repairs to equipment & accessories
3. Setup for shielded metal arc welding operations
4. Operate shield metal arc welding equipment
5. Execute corrective actions to repair surface flaws on welds & base metals
6. Make fillet welds, all positions, on CS or SS plate using SS electrodes
7. Make groove welds, all positions, on CS or SS plate using SS electrodes
8. Perform an all position WQT on CS or SS plate using SS electrodes
9. Make fillet welds, all positions, on CS pipe
10. Make 2G, 5G & 6G groove welds on CS pipe
11. Perform a 6G unlimited thickness qualification test on CS pipe

UNIT 2: GAS METAL ARC WELDING (GMAW, GMAW-S)

1. Perform safety inspections of equipment & accessories
 2. Make minor external repairs to equipment & accessories
 3. Setup for gas metal arc welding operations on CS
 4. Operate gas metal arc welding equipment
 5. Execute corrective actions to repair surface flaws on welds & base metals
- GMAW SPRAY TRANSFER*
6. Make fillet welds, all positions, on aluminum plate
 7. Make groove welds, all positions, on aluminum plate
 8. Perform a WQT on aluminum plate
 9. Make fillet welds in the 2F position, on CS pipe, using SPRAY TRANSFER.
- GMAW-S SHORT-CIRCUIT TRANSFER*
10. Make fillet welds, all positions, on CS pipe, using Short-circuit transfer
 11. Make 2G & 5G groove welds, on CS pipe, using short-circuit transfer
 12. Perform a combined WQT on CS pipe & plate

UNIT 3: FLUX CORE ARC WELDING (FCAW-S, FCAW-G)

1. Perform safety inspections of equipment & accessories
 2. Make minor external repairs to equipment & accessories
 3. Setup for flux core welding operations on CS
 4. Operate flux core welding equipment
 5. Execute corrective actions to repair surface flaws on welds & base metals
- FCAW-S SELF-SHIELDED*
6. Make fillet welds, all positions, on CS pipe using self-shielded electrodes
 7. Make 2G & 5G groove welds, on CS pipe, using self-shielded electrodes
- FCAW-G GAS-SHIELDED (DUAL GAS SHIELDED)*
8. Make fillet welds, all positions, on CS pipe, using gas-shielded electrodes
 9. Make 2G & 5G groove welds, on CS pipe, using gas-shielded electrodes
 10. Perform a combination WQT on CS pipe & plate

UNIT 4: GAS TUNGSTEN ARC WELDING (GTAW)

1. Perform safety inspections of equipment & accessories
2. Make minor external repairs to equipment & accessories
3. Setup gas tungsten arc welding operations on CS, Alum & SS
4. Operate gas tungsten arc welding equipment
5. Execute corrective actions to repair surface flaws on welds & base metals
6. Make 3F & 4F fillet welds on Aluminum sheet
7. Make 2G-4G groove welds on Aluminum sheet

8. Make 4F fillet welds on SS sheet
9. Make 3G-4G groove welds on SS sheet
10. Make fillet welds, all positions, on CS round tubing
11. Make fillet welds, all positions, on Aluminum round tubing
12. Make fillet welds, all positions, on SS round tubing
13. Make 2G-5G groove welds on CS round tubing
14. Make 2G-5G groove welds on Aluminum round tubing
15. Make 2G-5G groove welds on SS round tubing
16. Perform a combination WQT on plain CS & SS round tubing & sheet
17. Perform a combination WQT on Aluminum round tubing & sheet

Textbooks

Provided by Instructor

Learner Supplies

Welding Kit provided by Bookstore or Baker's Gas & Ace Hardware

Welding Jacket with leather sleeves, cutting goggles, safety glasses, MIG gloves, workshop gloves, flint striker, and soapstone