WLDG1202-Fund Gas Metal (GMAW)

Catalog Description: Fundamental principles of Gas Metal Arc Welding (GMAW). Includes setup and safe use of GMAW equipment as well as instruction in various basic weld joints. Lecture Hrs = 1, Lab Hrs = 3

Prerequisite(s): None

Semester Credit Hours: 2
Lecture Hours per Week: 1
Lab Hours per Week: 3
Contact Hours per Semester: 64
State Approval Code: 4805080000

Course Subject/Catalog Number: WLDG 1202
Course Title: Fundamentals of Gas Metal Welding (GMAW)

Course Rationale:
A student completing this class will have the basic knowledge of the principles of gas metal arc welding.

Instructional Goals and Purposes:
The purpose of this course is to provide the learners with a basic knowledge of gas metal arc welding.

Learning Objectives:
After completing this course, the student should be able to know the basic fundamentals in gas metal arc welding. They should also know how to set up, handling, and the safe use of GMAW equipment.

Specific Course Objective:
Upon completion of this course, the student should be able to safely demonstrate and explain the following:

Gas Metal Arc Welding equipment, setup and operation
I. Introduction (1ai, 1aii)
II. Metal Transfer (1ai 1aii, 1aiiv 1av, 1bii, 1ci, 1civ)
   a. axial spray metal transfer
   b. globular transfer
   c. shielding gases for spray or pulsed-spray transfer
   d. buried-arc transfer
   e. short-circuiting transfer
III. Filler Metal specifications (1ai 1aii, 1aiiv 1av, 1bii, 1ci, 1civ)
IV. Wire Melting and deposition rates (1ai 1aii, 1aiiv 1av, 1bii, 1ci, 1civ)
V. Welding Power supplies (1ai 1aii, 1aiv 1av, 1bii, 1ci, 1civ)
   a. speed of the wire electrode
   b. power supplies for short-circuiting transfer
VI. Molten Weld Pool Control (1ai, 1aiii, 1bi, 1biv, 1bv, 1ci, 1cii, 1civ, 1cv)
   a. shielding gas
   b. power settings
   c. weave pattern
   d. travel speed
   e. electrode extension
   f. gun angle
VII. Equipment (1ai, 1aiii, 1bi, 1biv, 1bv, 1ci, 1cii, 1civ, 1cv)
   a. power source
   b. electrode feed unit
   c. push-type feed system
   d. linear electrode feed system
   e. spool gun
   f. electrode conduit
   g. welding gun
VIII. Spot welding (1ai, 1aiii, 1bi, 1biv, 1bv, 1ci, 1cii, 1civ, 1cv)

**Gas Metal Arc Welding**

I. Introduction (1ai, 1aii, 1aiiv, 1bi, 1bii, 1biv, 1bv, 1ci, 1cii. 1civ, 1cv)
II. Setup (1ai, 1aiii, 1bi, 1biv, 1bv, 1ci, 1cii, 1civ, 1cv)
   a. equipment setup
   b. threading wire
III. Gas Density and flow rates (1ai, 1aii, 1aiii, 1bi, 1bii, 1biii, 1ci, 1cv)
IV. Arc-voltage and Amperage characteristics (1ai, 1aii, 1aiii, 1bi, 1bii, 1biii, 1biv, 1ci)
V. Electrode Extension (1ai, 1aii, 1aiii, 1bi, 1bii, 1biii, 1biv, 1ci)
VI. Welding gun angle (1ai, 1aii)
VII. Effect of Shielding gas on welding (1ai, 1aii, 1aiv, 1bi, 1bii, 1biii, 1biv, 1ci, 1cii. 1civ, 1cv)
VIII. Metal preparation (1ai, 1aiii, 1bi, 1bii, 1biii, 2aii)
IX. Flat Position (1ai 1aii, 1aiii)
X. Vertical up Position (1ai 1aii, 1aiii)
XI. Vertical down Position (1ai 1aii, 1aiii)
XII. Horizontal Position (1ai 1aii, 1aiii)
XIII. Overhead Position (1ai 1aii, 1aiii)
XIV. Globular Metal Transfer (1ai 1aii, 1aiii)
XV. Axial Spray (1ai 1aii, 1aiii)

**Flux Cored Arc Welding Equipment, setup and operation**

I. Introduction (1ai, 1aii, 1aiiv, 1bi, 1bii, 1biv, 1bv, 1ci, 1cii. 1civ, 1cv)
II. Principles of Operation (1ai, 1aii, 1aiiv, 1bi, 1bii, 1biv, 1bv, 1ci, 1cii. 1civ, 1cv)
   a. carbon
   b. slag
III. Equipment (1ai, 1aii, 1aiiv, 1bi, 1bii, 1biv, 1bv, 1ci, 1cii. 1civ, 1cv)
   a. power supply
   b. guns
   c. smoke extraction nozzles
   d. electrode feed
IV. Advantages (1ai, 1aii, 1aiii, 1biv, 2ai, 2ci)
   a. high deposition rate
   b. minimum electrode waste
   c. narrow groove angle
   d. minimum pre-cleaning
   e. all-position welding
f. flexibility

g. high quality

i. excellent control

V. Limitations (1ai, 1aii, 1bi, 1biv, 1bv)

VI. Electrodes (1ai, 1aii, 2ai, i)
   a. methods of manufacturing
   b. electrode cast and helix

VII. Flux (1ai, 1aii, 2aii, i)
   a. rutile-based flux
   b. lime-based flux

VIII. Flux Cored Steel Electrode Identification (1ai, 1aii, 2aii, i)

IX. Metal Cored Steel Electrode Identification (1ai, 1aii, 2aiii, i)

X. Shielding Gas (1ai, 1aii, 1biv, 2aiii, i)

XI. Welding Techniques (1ai, 1aii, 1aiiii, 2ai, 2ei, i)
   a. gun angle
   b. forehand, backhand, & perpendicular
      1. Advantages
      2. Disadvantages
   c. travel speed
   d. mode of metal transfer
      1. Spray
      2. Globular
   e. electrode extension
   f. porosity

Flux Cored Arc Welding

I. Introduction (1ai, 1aii, 1aii, 1aii, 1aii, 1bi, 1bii, 1biv, 1bv, 1ci, 1cii, 1civ, 1cv)

II. Practices (1ai, 1aii, 2aiii, 2ai, 2di, 2dii)
   a. FCAW equipment setup
   b. threading FCAW wire

III. Flat position Welds (1ai, 1aii, 1biv, 2aii, 2ei, i)
   a. stringer beads flat position

IV. Square-groove Welds (1ai, 1aii, 1biv, 2aii, 2ei, i)
   a. butt joint

V. V-groove and Bevel –groove welds (1ai, 1aii, 1biv, 2aii, 2ei, i)
   a. root pass
   b. filler pass
   c. cover pass

VI. Fillet Welds (1ai, 1aii, 1biv, 2aii, 2ei, i)
   a. lap joint
   b. tee joint

VII. Vertical welds (1ai, 1aii, 1biv, 2aii, 2ei, i)
   a. amperage
   b. voltage
   c. ranges

VIII. Horizontal welds (1ai, 1aii, 1biv, 2aii, 2ei, i)

IX. Thin-gauge Welding (1ai, 1aii, 1biv, 2aii, 2ei, i)
Grading Policy:
Your Grade will be determined from:

1. Assignments (10%)
2. Lab work (30%)
3. Quiz’s (10%)
4. Attendance (20%)
5. Exams (30%)

Textbook and Supplies Requirement:

1. Pen and Pencil
2. Notebook
4. Welding hood
5. Welding gloves
6. Safety Glasses
7. Boots
8. Welding shirt
9. Pliers
Secretary of Labor’s Commission on Achieving Necessary Skills (SCANS)

1. BASIC SKILL COMPETENCIES

A. Basic Skills
i. **Reading:** Locate, understand and interpret written information in prose and in documents such as manuals, graphs and schedules.
ii. **Writing:** Communicate thoughts, ideas, information and messages in writing, and create documents such as letters, directions, manuals, reports, graphs, and flow charts.
iii. **Arithmetic & Mathematical Operations:** Perform basic computations and approach practical problems by choosing appropriately from a variety of mathematical techniques.
iv. **Listening:** Receive, attend to, interpret, and respond to verbal messages and other cues.
v. **Speaking:** Organize ideas and communicate orally.

B. Thinking Skills
i. **Creative Thinking:** Generate new ideas.
ii. **Decision Making:** Specify goals and constraints generate alternatives, consider risks and evaluate and choose the best alternative.
iii. **Problem Solving:** Recognize problems and devise and implement plan of action.
iv. **Visualize ("Seeing Things in the Mind's Eye"):** Organize and process symbols, pictures, graphs, objects, and other information.
v. **Knowing how to learn:** use efficient learning techniques to acquire and apply new knowledge and skills
vi. **Reasoning:** Discover a rule or principle underlying the relationship between two or more objects and apply it when solving a problem.

C. Personal Qualities
i. **Responsibility:** Exert a high level of effort and persevere toward goal attainment.
ii. **Self-Esteem:** Believe in one's own self-worth and maintain a positive view of oneself.
iii. **Sociability:** Demonstrate understanding, friendliness, adaptability, empathy, and politeness in group settings.
iv. **Self-Management:** Assess oneself, set personal goals, monitor progress, and exhibit self-control.
v. **Integrity & Honesty:** Choose ethical courses of action.
2. WORKPLACE COMPETENCIES

A. Resources:
i. Time: Select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.
ii. Money: Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.
iii. Material & Facilities: Acquire, store, allocate, and use materials or space efficiently.
iv. Human Resources: Assess skills and distribute work accordingly, evaluate performance and provide feedback.

B. Interpersonal Skills:
i. Participate as Member of a Team: Contribute to group effort.
ii. Teach Others New Skills.
iii. Serve Clients/ Customers: Work to satisfy customers' expectations.
iv. Exercise Leadership: Communicate ideas to justify position, persuade & convince others, responsibly challenge existing procedures & policies.
v. Negotiate: Work toward agreements involving exchange of resources, resolve divergent interests.
vi. Work with Diversity: Work well with men and women from diverse backgrounds.

C. Information:
i. Acquire and Evaluate Information.
ii. Organize and Maintain Information.
iii. Interpret and Communicate Information.
iv. Use computers to process information.

D. Systems:
i. Understand Systems: Know how social, organizational and technological systems work and operate effectively with them.
ii. Monitor & Correct Performance: Distinguish trends, predict impacts on system operations, and diagnose deviations in systems' performance.
iii. Improve or Design Systems: Suggest modifications to existing systems and develop new or alternative systems to improve performance.

E. Technology
i. Select Technology: Choose procedures, tools or equipment including computers and related technologies.
ii. Apply Technologies to Task: Understand overall intent and proper procedures for setup and operation of equipment.
iii Maintain and Troubleshoot Equipment: Prevent, identify, or solve problems with equipment, including computers and other technologies.