COURSE SYLLABUS

WLDG1428 - Intermediate to Shielded Metal Arc Welding (SMAW)

Catalog Description: An introduction to shielded metal arc welding (SMAW) process with an emphasis placed on power sources, electrode selection, and oxy-fuel cutting. Instruction provided in SMAW fillet welds in various positions. Lecture Hrs = 3, Lab Hrs = 2

Prerequisite(s): None

Semester Credit Hours: 3
Lecture Hours per Week: 3
Lab Hours per Week: 2
Contact Hours per Semester: 80
State Approval Code: 4805080000

Course Subject/Catalog Number: WLDG 1428
Course Title: Intermediate to Shielded Metal Arc Welding (SMAW)

Course Rationale:
A student completing this class will be able to weld a T-Fillet with a 6010 & 7018 electrode in the flat, horizontal, vertical, and overhead positions.

Instructional Goals and Purposes:
The purpose of this course is to provide the learners with the basic knowledge of Shielded Metal Arc Welding (SMAW).

Learning Objectives:
After completing this course, the student should be able to select electrodes and amperage settings for various thicknesses of materials and welding positions; define principles of arc welding; and interpret electrode classifications. Perform SMAW operations in various positions using selected electrodes and different joint designs.

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

Shielded Metal Arc Welding of Plate
I. Introduction (1ai, 1bi)
II. Shielded Metal Arc Welding Safety (1ai, 1aii, 1aiii, 1aiiv, 1bii, 1ci, 1ci, 1civ)
   a. Striking the Arc
   b. Striking the Arc Accurately
III. Effect of Too High or Too Low Current Settings (1ai, 1aii, 1aiii, 1bii, 1biii, 1biv, 1bv, 1ci, 1civ)
   a. Effect of Amperage Changes on a Weld Bead
IV. Electrode Size and Heat (1ai, 1aii, 1aiii, 1bii, 1biii, 1biv, 1bv, 1ci, 1ci, 1cii, 1ciii, 1civ, 1cv)
   a. Chill plate
   b. Excessive Heat
V. Arc Length (1ai, 1aii, 1aiii, 1bii, 1biv, 1ci, 1cii, 1civ)
a. Amperage range
b. Effect of changing the arc length on a weld

VI. Electrode Angle (1ai, 1aii, 1aiii, 1bii, 1biv, 1civ)
a. Leading angle
b. Trailing angle
c. Effect of changing the electrode angle on a weld

V. Electrode Manipulation (1ai, 1aii, 1bii, 1biii, 1ci, 1cii, 1civ)
a. Weave pattern

VI. Positioning of the Welder and the Plate (1ai, 1aii, 1aiii, 1bi, 1bii, 1biv, 1bv, 1ci, 1ciii, 1civ, 1cv)

VII. Practice Welds (1ai, 1aii, 1av, 1bi, 1bii, 1biv, 1bv, 1ci, 1cii. 1ciii, 1civ, 1cv)
a. Electrodes
b. Cellulose-based fluxes
c. Rutile-based fluxes
d. Mineral-based fluxes

VIII. Stringer Beads (1ai, 1aii, 1aiii, 1bi, 1bii, 1biii, 1bv, 1ci, 1cii, 1civ)
a. In the Flat position
b. In the Vertical up position
c. Horizontal stringer Beads

IX. Square Butt Joint (1ai, 1aiii, 1av, 1bi, 1bii, 1biii, 1biv, 1ci. 1cii, 1civ, 1cv)
a. In the flat position
b. In the Vertical up position
c. Welded horizontal

X. Edge Weld (1ai, 1aiii, 1av, 1bi, 1bii, 1biv, 1bv, 1ci, 1civ, 1cv)
a. In the flat position
b. In the vertical down position
c. In the vertical up position
d. In the horizontal position
e. In the overhead position

XI. Outside Corner Joint (1ai, 1aiii, 1av, 1bi, 1bii, 1biv, 1bv, 1ci, 1cii, 1ciii, 1civ, 1cv)
a. In the flat position
b. In the vertical down position
c. In the vertical up position
d. In the horizontal position
e. In the overhead position

XII. Lap joint (1ai, 1aiii, 1av, 1bi, 1bii, 1biv, 1bv, 1ci, 1cii, 1ciii, 1civ, 1cv)
a. In the flat position
b. In the horizontal position
c. In the vertical position
d. In the overhead position

XIII. Tee Joint (1ai, 1aiii, 1av, 1bi, 1biv, 1bv, 1ci, 1cii, 1ciii, 1civ, 1cv)
a. In the flat position
b. In the horizontal position
c. In the vertical position
d. In the overhead position

Flame Cutting

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

II. Metals cut by the Oxyfuel Process (1ai, 1aiii, 1bi, 1bii, 1biv, 1bv, 1ci, 1cii, 1civ)

III. Eye protection for Flame cutting (1ai, 1aii, 1aiii, 1bi, 1bii, 1biv, 1bv, 1ci, 1cii, 1civ)

IV. Cutting Torches (1ai, 1aii, 1bi, 1bii, 1biv, 1bv, 1ci, 1cii, 1civ, 1cv)
a. equal-pressure torches
b. venturi
c. cutting lever
d. machine cutting torch

V. Cutting Tips (1ai, 1aiii, 1bi, 1bii, 1biv, 1bv, 1ci, 1cii, 1civ, 1cv)
a. high-speed
b. preheat flame
c. preheat holes

VI. Oxyfuel cutting, setup, and operation (1ai, 1aii, 1aiii, 1bii, 1biii, 1biv, 1ci, 1cii, 1ciii, 1civ, 1cv)
   a. setting up a cutting torch
   b. cleaning a cutting tip
   c. lighting the torch

VIII. Hand cutting (1ai, 1aii, 1aiii, 1bii, 1biii, 1biv, 1ci, 1cii, 1ciii, 1civ, 1cv)
   a. coupling distance

IX. Layout (1ai, 1aii, 1aiii, 1bii, 1biii, 1biv, 1bv, 1ci, 1cv)
   a. soapstone

X. Selecting the Correct tip and setting the pressure (1ai, 1aiii, 1bii, 1bv)

XI. The Chemistry of a cut (1ai, 1aii, 1av, 1bii, 1biv, 1bv, 1ci)
   a. preheat
   b. speed
   c. pressure
   d. slag

XIII. Plate cutting (1ai, 1aii, 1av, 1bii, 1biv, 1bv, 1ci, 1cv)

XIV. Cutting table (1ai, 1aii, 1av, 1bii, 1biv, 1bv, 1ci, 1civ)

XV. Torch guides (1ai, 1aiv, 1bii, 1bv)
   a. thin plate
   b. thick plate
   c. sheet metal
   d. flame cutting holes

XVI. Distortion (1ai, 1aii, 1bii, 1biii, 1biv, 1ci, 1civ, 1cv)
   a. beveling a plate
   b. vertical straight cut
   c. overhead straight cut

XVII. Cutting applications (1ai, 1aii, 1bii, 1biv)
   a. internal shapes
   b. external shapes

XVIII. Pipe cutting (1ai, 1aii, 1aiv, 1bii, 1ci, 1civ)
   a. square cut on pipe horizontal rolled position
   b. square cut on pipe horizontal fixed position
   c. square cut on pipe vertical position

**Oxyfuel Welding and Cutting Equipment, Setup, and Operation**

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

II. Pressure Regulators (1ai, 1aii, 1biv, 1bv, 1cv, 2ci, 2cii, 2ciii, 2civ)
   a. regulator gauges
      1. Working pressure
      2. Line drop
      3. Cylinder pressure
      4. Bourdon tube
      5. Atmospheric pressure
      6. Gauge pressure
      7. Absolute pressure
   b. safety release device
      1. Safety release valve
      2. Safety disc
      3. Seat
   c. fittings
   d. safety precautions
1. Creep
2. Leak-detecting solution

III. Welding and Cutting Torches Design and Service (1ai, 1aii, 1bv, 2aiii, 2di)
   a. mixing the gases
      1. Mixing chamber
      2. Injector chamber
   b. torch care and use
      1. Valve packing

IV. Welding and Heating Tips (1ai, 1aii, 1bv, 2aiii, 2di)
   a. tip care and use

V. Reverse Flow and Flashback Valves (1ai, 1aii, 1bv, 2aiii, 2di)
   a. care of the reverse flow valve and flashback arrestor

VI. Hoses and Fittings (1ai, 1aii, 1bv)
   a. hose care and use

VII. Backfires and Flashbacks (1ai, 1aii, 1bii, 1bv)

VIII. Types of Flames (1ai, 1aii, 1bii, 1bv)

IX. Leak Detection (1ai, 1aii, 1bii, 1bv)
   a. manifold operation

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.