WLDG 2451  
Advanced Gas Tungsten Arc Welding (GTAW)

Semester Hours  
4

Textbook  
Gas Tungsten Arc Welding Handbook, William H. Minnick
Modern Welding, Althouse, Turquist, & Bowditch

Course Description  
Advanced topics in GTAW welding, including welding in various positions and directions.

Course Learning Outcomes: 
The student will exhibit expertise in various welding positions; describe safety rules and equipment used; and describe the effects of welding parameters in GTAW. The student will weld various joint designs; diagnose welding problems; and perform visual inspection.

Supplementary Material  
Filmstrips
Videos
Handout Material

Program Objectives:

1. Given instructions and practice the student will be able to name the various shielding gases, methods of metal transfer, and components of a GTAW station. This knowledge will be evidenced by laboratory demonstrations, completion of assignment sheets, and by scoring the college minimum satisfactory grade on a written exam within a 50 minute time period.
   
   A. Name the four most common shielding gases used in GTAW.

   B. Name the main components of the GTAW outfit.

2. Given instructions and practice the student will select shielding gases for various metals and setup a GTAW station. This knowledge will be evidenced by laboratory demonstrations, completion of assignment sheets, and by scoring the college minimum satisfactory grade on a written exam within a 50 minute time period.
A. Select the proper gas or gases mixture necessary to shield various metals welding with the GTAW process.

B. Adjust gas mixture and flow rate necessary to shield the arc while welding with the GTAW.

3. Given instructions and practice the student will be able to setup a GTAW station and make the necessary adjustments such as current, voltage, and gas flow necessary to weld on various sizes of pipe.

   A. Assemble the components such as booth, welding machine, flowmeter, gun, control system, and setup a complete (GTAW) outfit. Safety will be stressed.

   B. Inspect welding station for safety such as electrical shock, arc flash, and ventilation.

4. Given instructions and practice make welds on pipe nipples in the 2G, 5G, and 6G positions using the uphill, downhill, push and pull methods of welding on mild steel, stainless steel, and aluminum. This knowledge will be evidenced by laboratory demonstrations, completion of assignment sheets, visual inspection test, destruction test according to American Welding Society Welding Codes, and by scoring the college minimum satisfactory grade on a written exam within a 50 minute time period.

   A. Set machine and weld pipe nipples in the 2G position.

   B. Set machine and weld pipe nipples in the 5G position.

   C. Set machine and weld pipe nipples in the 6G position.

**Teaching Methods:**

1. Individual and group instructions in the lab.

2. Group of two or three students will work together on lab projects.

3. Individual and group instruction in the classroom.

**Evaluation Methods:**

1. Attendance
2. Lab tests and lab performance
3. Destructive method using a guided bend tester
4. Written Exams

Course Outline:

I. Shielding Gases
   A. Argon
   B. Helium
   C. Nitrogen
   D. Carbon dioxide

II. GTAW Outfit
   A. Welding machine
   B. Shielding gas cylinder
   C. Flowmeter and regulator
   D. Control system
   E. Manually held gun

III. Gas Selection for Various Metal
   A. Gases combination for aluminum
   B. Gases combination for low alloy steel
   C. Gases combination for copper
   D. Gases combination for carbon steel
   E. Gases combination for stainless steel

IV. Setup Welding station
   A. Assemble components
   B. Adjust Variables
   C. Check for safety

V. Practice GTAW Welding
   A. 2G position
   B. 5G position
   C. 6G position

Grading Policy:

Lecture Evaluation 20%
Practical Application (Lab) 80%
**Attendance Policy:**

Students must attend all classes. Excessive absenteeism will have a detrimental effect on the student grade. Students can be dropped from classes for excessive absenteeism. The instructor will call roll at the beginning and end of each class or any time he/she feels it necessary. Three (3) times tardy will count as one (one) absence. The attendance record starts the first day of class beginning of each semester.

**Course Outline:**

I. Shielding Gases
   A. Argon
   B. Helium
   C. Nitrogen
   D. Carbon dioxide

II. GTAW outfit
   A. Welding machine
   B. Shielding gas cylinder
   C. Flowmeter and regulator
   D. Control system
   E. Manually held hand torch

III. Gas selection for mild steel and stainless steel

IV. Setup Welding station
   A. Assemble components
   B. Adjust Variables
   C. Check for safety

V. Practice GTAW on mild steel
   A. Lap joints
   B. T-cross
   C. V-groove
**COMPETENCY PROFILE**  
(REV.8/10)

**STUDENT** ___________________________  
**COURSE** WLDG 2451

**INSTRUCTOR** ___________________________  
**SEM./YEAR** ___________________________

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**RATING SCALE:**

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<tr>
<th>Rating</th>
<th>Description</th>
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<tr>
<td>4</td>
<td>Skilled: Can work independently with no supervision.</td>
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<td>3</td>
<td>Moderately Skilled: Can perform job completely with limited supervision</td>
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<td>2</td>
<td>Limited Skill: Requires instruction and close supervision.</td>
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<td>1</td>
<td>No Exposure: No experience or knowledge in this area.</td>
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<th><strong>COMPETENCY</strong></th>
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<td>Identifies and selects power source.</td>
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<td>Properly uses bench, and portable grinder.</td>
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<td>Identifies, selects, and safely handles shielding gases.</td>
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<td>Identifies, selects, shapes, and installs tungsten electrode.</td>
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<td>Sets welding current for correct weld procedure.</td>
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<td>Identifies welding problems, their causes, and takes corrective action.</td>
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<td>Adjusts current, gas flow setting and strikes arc.</td>
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<td>Identifies, selects joint design, and prepares metal.</td>
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<td>Identifies base material selects filler rod.</td>
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<td>Makes V-groove, butt joint pipe test in the 2G position.</td>
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<td>Makes V-groove, butt joint pipe test in the 5G position.</td>
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<td>Makes V-groove, butt joint pipe test in the 6G position.</td>
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<td>Prepares weld for test.</td>
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<td>Passes visual test.</td>
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<td>Passes Destructive test.</td>
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