WELD 0003B - GAS TUNGSTEN ARC WELDING (TIG) - CAREER PATH

Catalog Description

Formerly known as WELD 50
Prerequisite: Completion of WELD 3A with grade of "C" or better
Advisory: Completion of WELD 1A with grade of "C" or better
Hours: 72 (18 lecture, 72 laboratory)
Description: Tungsten Inert Gas Welding methods and techniques used to weld carbon steel, stainless, aluminum, and alloy steels. Instruction in equipment setup for different metals, filler selection, material identification, and welding techniques using Gas Tungsten Arc Welding. Laboratory exercises include multiple positions of fillet and groove welds with carbon steel, stainless steel and aluminum assignments on sheet materials and techniques as applied in tubing or pipe. (CSU)

Course Student Learning Outcomes

- CSLO #1: Apply knowledge of safety standards for both a learning environment and work site environment with focus on GTA welding process to perform student assignments.
- CSLO #2: Define terms related to this course; collet and collet body, tungsten, inert, alternating frequency, square wave output.
- CSLO #3: Develop, analyze and practice manipulative skills GTAW welding with selected techniques on Carbon steel sheet, Stainless steel sheet, and Aluminum material with unbalance alternating current application, and a/c frequency adjustments.
- CSLO #4: Complete manipulative final project as part of the course.
- CSLO #5: Research and formally make a presentation on selected GTAW subject by participation in a group learning process.

Effective Term

Fall 2019

Course Type

Credit - Degree-applicable

Contact Hours

72

Outside of Class Hours

36

Total Student Learning Hours

108

Course Objectives

Lecture Objectives:
1. Establish expectation standards for proper and safe use welding and related equipment as used in education and job settings.
2. Discuss safe practices in the correct procedure to prepare the TIG torch and setup Gas Tungsten Arc Welding machine.
3. Identify the electrical shock hazards associated with high frequency arc starting used in the GTAW process.
4. Define and discuss the tungsten electrodes for welding Ferrous and Non-ferrous metals with different welding currents.
5. Examine terminology, purpose, and function of the GTAW torch.
6. Compare the filler metals used in welding various Aluminum and Stainless steel alloys as well as applications in Carbon Steel.
7. Identify the characteristics low and medium carbon steels and High Strength Low Alloys (HSLA).
8. Identify the characteristics stainless steel and other chromium-nickel and chromium-moly alloys.
9. Identify the characteristics aluminum and related alloys.
10. Outline the setup required to weld various metals; then compare different joint preparation techniques of machining or grinding as used in each.
11. Distinguish the differences between Squarewave Silicon Control Rectifier and Advanced Squarewave Inverter machines.
12. Distinguish the industry standards of material identification systems.
13. Examine unbalanced alternating current wave forms and each of it's advantages.
14.Contrast alternating current frequency changes in the arc cone width.
15.Recognize the advantages and dis-advantages of advanced squarewave technology.
Laboratory Objectives:
1. Demonstrate safety practices used with Gas Tungsten Arc welding process. Awareness of specific shock hazards present in GTAW with arc starting systems.
2. Demonstrate and practice assembly of the GTAW torch.
3. Analyze the tungsten electrode types and sizes, demonstrate proper electrode preparation and use.
4. Compare filler metal types, sizes and function in performing assigned jobs.
5. Contrast types of GTAW machines and current setup in practice for the type of metal to be welded.
6. Employ welding techniques associated with low and medium carbon steels and High Strength Low Alloys (HSLA).
7. Employ welding techniques associated with stainless steel and other chromium-nickel and chromium-moly alloys.
8. Employ welding techniques associated with aluminum and related alloys.
9. Utilize the differences between Squarewave Silicon Control Rectifier and Advanced Squarewave Inverter machines and the benefits of each type machine.
10. Apply proper techniques in the GTA welding process to construct lap and tee joint fillet welds on thin carbon steel assignments.
11. Formulate and apply advanced techniques in GTA welding process to construct both open and closed butt groove welds on carbon steel assignments of various thicknesses.
12. Recognize changes in material behavior in constructing lap and tee joint fillet welds on stainless steel as compared to carbon steel.
13. Construct lap and tee joint fillet welds on aluminum alloy using alternating current and differing techniques from ferrous metals.
14. Compare and apply different joint preparation techniques of machining or grinding as used in material and joint design.
15. Complete practical final lab weld assembly assignment.

General Education Information

- Approved College Associate Degree GE Applicability
- CSU GE Applicability (Recommended-requires CSU approval)

- Cal-GETC Applicability (Recommended - Requires External Approval)
- IGETC Applicability (Recommended-requires CSU/UC approval)

Articulation Information

- CSU Transferable

Methods of Evaluation

- Objective Examinations
  - Example: Examination on principles, application and knowledge of Gas Tungsten Arc Welding. Example: Explain the difference in conductivity between helium and argon gas.
- Projects
  - Example: Student final manipulative assignment is project based and rubric grading.
- Skill Demonstrations
  - Example: Student is evaluated based on American Welding Society acceptance criteria on visual appearance of welds for each assignment; for example, 1st stainless steel assignment of lap joint, tee joint and outside corner joint.

Repeatable

No

Methods of Instruction

- Laboratory
- Lecture/Discussion
- Distance Learning

Lab:

1. With instructor's demonstration and oversight, students will apply various techniques to the material types to be welded, for example carbon steel.
2. Following class lecture, video presentation, and lab demonstration, students are directed in the practice of manipulative skills in Gas Tungsten Arc Welding applications.

Lecture:

1. Lecture and interpersonal group discussion on the various applications of Gas Tungsten Arc welding processes followed by student presentations of group results.

Distance Learning

1. Instructor will use slide show presentation, instructor created video, or lecture presentation on a learning platform to teach about best safety practices in the for personal protective equipment, the weld lab environment, and/or tools & equipment. Students will be given a scenario and expected to list the best safety practices that should be employed and explain why they should be used. Students will submit the assignment via text entry, file upload, video or audio recording.

Typical Out of Class Assignments Reading Assignments

1. Read the chapter in the text on the differences between modern Square wave and the Advanced Square wave GTAW machines and be prepared to discuss in class. Example: Silicon controlled rectifier vs. inverter technology. 2. The student will research subject matter of the topic assigned to him/her for presentation to the class. Example: Plasma effect of the Tungsten arc in inert gas.

Writing, Problem Solving or Performance

1. Report from the reading assignments, the welding procedures and welding joint designs and visual acceptance criteria to welding code. 2. Demonstrate performing the skill sets of the various weld jobs assigned in lab assignments during each lab meeting. Example: TIG welding techniques in welding stainless.

Other (Term projects, research papers, portfolios, etc.)

1. Students are required to complete a practical (hands on lab) final assignment. Additionally, each student is assigned to a group presentation. Each group presents orally one of the various types of Tungsten electrode alloys.

Required Materials

- Welding Principles and Practices
  - Author: Edward R. Bohnart
  - Publisher: McGraw-Hill
  - Publication Date: 2017
  - Text Edition: 5th
  - Classic Textbook?:
  - OER Link:
  - OER:
- Welding: Principles and Applications
  - Author: Larry F. Jeffus
  - Publisher: Delmar / Cengage Learning
  - Publication Date: 2012
  - Text Edition: 7th
  - Classic Textbook?:
  - OER Link:
  - OER:
- Welding Process Training Series #7 GTAW
  - Author: Miller Electric Mfg.
  - Publisher: Miller Electric Mfg.
  - Publication Date: 2015
  - Text Edition: 2nd
  - Classic Textbook?:
  - OER Link:
  - OER:
- TIG Handbook
  - Author: Miller Electric Mfg.
  - Publisher: Miller Electric Mfg.
  - Publication Date: 2005
  - Text Edition: 2nd
  - Classic Textbook?:
  - OER Link:
  - OER:
- Gas Tungsten Arc Welding
  - Author: William H. Minnick
  - Publisher: Goodheart-Willcox
  - Publication Date: 2006

- Text Edition: 5th
- Classic Textbook?:
- OER Link:
- OER:

Other materials and-or supplies required of students that contribute to the cost of the course.