

WELD 0005A - INTRODUCTION TO SHIELDED METAL ARC WELDING (SMAW) - CAREER PATH

Catalog Description

Formerly known as WELD 20

Advisory: Concurrent enrollment in WELD 1A or previous welding experience

Hours: 72 (18 lecture, 54 laboratory)

Description: An introduction to the principles of shielded metal arc welding (SMAW), setup/use of SMAW equipment, and safe use of tools and equipment including oxyacetylene cutting. Provides instruction in welding carbon steel weld joints in various positions. This is a required foundation welding technology course for students who wish to pursue a career in structural or pipe welding outdoors at various construction sites. (C-ID WELD 101X) (not transferable)

Course Student Learning Outcomes

- CSLO #1: Apply knowledge of safety standards for both a learning environment and work site environment with focus on Shielded Metal Arc Welding plus Oxyacetylene Cutting, to perform student assignments.
- CSLO #2: Define terms related to this course; constant current output, duty cycle, fast freeze electrode, fill freeze electrode, low hydrogen, stringer or weave manipulation, regulator, undercut, weld toe and fillet weld size.
- CSLO #3: Demonstrate manipulative skills using Shielded Metal Arc Welding with stringer and weave bead techniques on carbon steel plate in flat, horizontal, vertical and overhead fillet weld positions.
- CSLO #4: Analyze the relationship between heat input and metal fusion. Explain how current setting, arc length, travel and work angles, travel speed and electrode manipulation affect the heat input in a weld puddle.
- CSLO #5: Demonstrate safe handling and proper manipulative skills using Oxyacetylene Cutting to cut steel.

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. Evaluate safety issues as they pertain to shop safety, industrial safety, and personal safety and apply appropriate safety protective measures.
2. Describe the SMAW process and list the other terms used to identify the process. Correctly assemble the parts of a SMAW welding station. Analyze welding operation requirements for common applications and select the proper power source.
3. Employ pre-weld metal preparation techniques to ensure weld quality. Demonstrate pre-weld procedures and apply correct welding parameter adjustment tasks.
4. Apply foundational skills to weld carbon steel weld joints to meet industry-based acceptance criteria. Explain what factors affect each of the following parameters before and during welding: Current, Arc length, Travel angle, Travel Speed, and Electrode Manipulation.
5. Discuss the 4 basic weld types (surface, fillet, groove, plug/slot) and how and when they should be applied to the 5 basic weld joints (butt, lap, tee, corner, edge) Properly identify the basic parts of a welding symbol: arrow, reference line, and tail.
6. Name common SMAW electrodes (F1, F2, F3, F4 Groups) and discuss their advantages/disadvantages for welding common metal alloys.
7. Become familiar with basic safety, setup, use, and shut-down operations associated with Oxyacetylene Cutting. Demonstrate simple cutting techniques in lab.
8. Explain the basic relationship between carbon content and strength, hardness, ductility, and weldability. Identify low, medium, and high carbon steel.
9. Analyze and apply the difference between discontinuities and defects. Label common discontinuities and examine their root cause and prevention measures.
10. Categorize the personal traits that employers look for in their employees.
11. Recall common terminology used in the application of welding operations and apply to lab setting.

Laboratory Objectives:

1. Use safe shop practices;
 - a. Employ the correct use of Personal Protective Equipment in welding applications.
 - b. Correctly and safely operate various types of welding equipment.
2. Contrast the behavior and techniques used with various electrodes groups;
 - a. F1 Fast fill.
 - b. F2 Fill freeze.
 - c. F3 Fast freeze.
 - d. F4 Low hydrogen.
3. Apply Shielded Metal Arc Welding techniques to successfully complete the following lab assignments:
 - a. Surface welds using 1/8" E-7024 (F1) using stringer technique.
 - b. Surface welds using 1/8" E-6013 (F2) using stringer technique.
 - c. 2F Tee joint using 1/8" E-7018 (F4) using stringer technique.
 - d. 3F Tee joint using 1/8" E-7018 (F4) vertical up using weave technique.
 - e. 3F Tee joint using 3/32" E-7018 (F4) vertical up using stringer technique.
 - f. 3F Tee joint using 5/32" E-6010 (F3) vertical down using stringer technique.
 - g. 3F Tee joint using 1/8" E-6010 (F3) vertical up using small whip & pause technique.
 - h. 3F Tee joint using 1/8" E-7018 (F4) vertical up using stringer technique.
 - i. 4F Tee joint using 1/8" E-6010 (F3) using small whip & pause technique.
 - j. 4F Tee joint using 1/8" E-7018 (F4) using stringer technique.

4. Operate Oxy-Acetylene Cutting (OAC) manual hand torch to successfully complete the following lab assignments:
 - a. Cut 1/4" flatbar using an OAC manual torch with correct size tip.
 - b. Cut a straight edge on 3/8" plate using an OAC manual torch with correct size tip.
 - c. Cut a straight edge on 1/2" or 1" plate using an OAC manual torch with correct size tip.

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

Methods of Evaluation

- Objective Examinations
 - Example: Tests, quizzes and assignments on welding and cutting equipment theory. Examples: Identify F1, F2, F3, F4 groups of electrodes. Describe the four types of SMAW power supplies.
- Skill Demonstrations
 - Example: Lab assignments in each welding process are covered in this course. Student work is evaluated and graded based on industry weld quality standards. Example: Students will perform 2F tee joint weld.

Repeatable

No

Methods of Instruction

- Laboratory
- Lecture/Discussion
- Distance Learning

Lab:

1. With Instructor demonstration and oversight, students will develop skill sets with the Oxy-Fuel cutting process.
2. Following class lecture, video presentation, and lab demonstration of welding with shielded metal arc welding, students will practice manipulative skills in SMAW.

Lecture:

1. Instructor driven lecture and interpersonal group discussion on the correct welding techniques used in Shielded Metal Arc Welding with each electrode classification followed by Instructor demonstrations and student training practice.

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. Student will research and read the the difference between a discontinuity and a defect. Student will be prepared to discuss the welder's role in preventing and repairing discontinuities and defects in the workplace. 2. Student will read the chapter from the textbook on Shielded Metal Arc Welding electrodes and will be prepared to discuss in class.

Writing, Problem Solving or Performance

1. Student will report, the 5 main factors that affect heat input and proper fusion in a weld. Student will explain what changes these parameters, why and how they are interrelated. 2. Student will complete the review questions at the end of the chapter as assigned. 3. Student will perform various welds on lab assignments during each class meeting.

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

Required Materials

- Modern Welding
 - Author: Althouse, Turnquist, Bowditch
 - Publisher: Goodheart-Willcox
 - Publication Date: 2020
 - Text Edition: 12th
 - Classic Textbook?:
 - OER Link:
 - OER:
- Welding Principles and Practices
 - Author: Edward R. Bohnart
 - Publisher: McGraw-Hill
 - Publication Date: 2017
 - Text Edition: 5th
 - Classic Textbook?:
 - OER Link:
 - OER:

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