

Revised by: T. Balestino
Revised by: D. Thornsberry
Revised by: D. Layne
Reviewed by: K. Bandy
Date Prepared: Spring 2017
C & GE approved: April 17, 2017
Board approved: May 10, 2017
Semester effective: Spring 2018

Welding (WELD) 1520 Gas Metal Arc Welding (GMAW) and Flux Core Arc Welding (FCAW) (3 Units) CSU

Prerequisite: Successful completion of WELD 1500 Welding Processes with a grade of 'C' or better.

Prerequisite knowledge and skills:

Before entering the course, the student should be able to:

1. understand the principles of safe work habits in a shop setting as related to oxy-fuel cutting and the various electric arc welding processes,
2. set up oxy-fuel cutting equipment for the cutting of ferrous and nonferrous alloys, and
3. apply basic understanding of the common welding processes while utilizing proper safety and technique (SMAW, GMAW, FCAW and GTAW).

Total Hours: 32 hours lecture; 59 hours lab (91 hours total)

Course Description: This course will cover the theory and application of the Gas Metal Arc Welding (GMAW) and Flux Core Arc Welding (FCAW) processes. Emphasis will be placed on the safe and proper application of these processes and the practical use of welding principles on mild steel, aluminum, and stainless steel. Welding will be demonstrated in a variety of positions. Structural certifications are a focus of this course. Additional supplies may be required. This course has a material fee.

Type of Class/Course: Degree Credit

Text: Moniz, B. J., and R. T. Miller. *Welding Skills*. 5th ed., American Technical Publishers, 2015.

Additional Instructional Materials:

Students are expected to have the following items:

1. #5 Shaded Safety Glasses & Clear Safety Glasses
2. Welding leather gloves
3. Work boots (above the ankle)
4. Long sleeve shirt & jeans (no holes or rips)
5. Welding hood/helmet
6. Welding cap
7. Pair of pliers (multi-use, wire cutters)
8. Wire brush
9. Chipping hammer

Optional material/equipment:

1. Grinder

Course Objectives:

By the end of the course, a successful student will be able to:

1. understand and practice safe work habits in and around a fabrication shop,
2. understand and practice safe work habits related to the Gas Metal Arc Welding (GMAW) and Flux Core Arc Welding (FCAW) processes,
3. demonstrate the setup, operation and theory related to the Gas Metal Arc Welding (GMAW) and Flux Core Arc Welding (FCAW) processes,
4. demonstrate the use of Gas Metal Arc Welding (GMAW) and Flux Core Arc Welding,
5. apply skills and knowledge required to successfully create a proper weldment in a variety of positions while using common welding electrodes, and
6. understand various welding codes and test requirements often associated with Gas Metal Arc Welding (GMAW) and Flux Core Arc Welding (FCAW).

Course Scope and Content: Lecture

- Unit I Introduction and Safety Procedures
 - A. Overview
 - B. Safety related to GMAW and FCAW
 - C. Safety related to gas cylinders and pressure reducing regulators
- Unit II Gas Metal Arc Welding (GMAW)
 - A. Equipment
 - B. Setup and operation
- Unit III Flux Core Arc Welding (FCAW)
 - A. Equipment
 - B. Setup and operation
- Unit IV Weld Joints
 - A. Butt
 - B. Lap
 - C. Tee
 - D. Edge
 - E. Corner
- Unit V Welding Positions and Sequencing
 - A. 1G Flat (x block, plate)
 - B. 2G Horizontal (x block plate)
 - C. 3G Vertical (x block plate)
 - D. 4G Overhead (x block plate)
 - E. D 1.1 3G certification test
- Unit VI Electrode Selection and Consumables
 - A. Filler metal identification
 - B. Parts and consumables related to GMAW and FCAW
 - C. Composition and requirements
 - D. Welding metallurgy

Unit VII Gas Cylinders and Pressure Reducing Regulators
A. Identification of gases
B. Transportation
C. Parameters
D. Proper assembly/disassembly

Unit VIII Welding Standards
A. Codes
B. Standards and costs

Unit IX Weld Quality
A. Testing
B. Inspection of welds
C. Defects and discontinuities

Unit X Welder Code Testing
A. Certification
B. qualification

Unit XI Plasma Arc Cutting (PAC) and Demonstration
A. Overview
B. Equipment
C. Setup and operation

Unit XII Welding Careers and Future Training
A. Future training opportunities
B. Possible career
C. Options and types

Course Scope and Content: Laboratory

Unit I Gas Metal Arc Welding (GMAW) and Flux Core Arc Welding (FCAW) Safety
A. Perform Job Safety Analysis (JSA)
B. Demonstrate safe operation of tools and equipment

Unit II Gas Metal Arc Welding (GMAW)
A. Perform adjustments and fine-tuning of equipment
B. Setup and operation

Unit III Flux Core Arc Welding (FCAW)
A. Perform adjustments and fine-tuning of equipment
B. Setup and operation

Unit IV Plasma Arc Cutting (PAC)
A. Perform adjustments and fine-tuning of equipment
B. Setup and operation

Unit V Weld Joints
A. Perform welds on different joints
B. Identify joint types

- Unit VI Welding Positions and Sequencing
- A. Perform welds in 1G flat position on x block and plate
 - B. Perform welds in 2G horizontal position on x block and plate
 - C. Perform welds in 3G vertical position on x block and plate
 - D. Perform welds in 4G overhead position on x block and plate
 - E. Complete D 1.1 3G certification test
- Unit VII Electrode Selection and Consumables
- A. Apply knowledge of electrodes to appropriate application
 - B. Identify and utilize parts and consumables
- Unit VIII Gas Cylinders and Pressure Reducing Regulators
- A. Apply knowledge of gases to appropriate application
 - B. Safe utilization and transportation
 - C. Safe and proper assembly/disassembly
- Unit IX Weld Quality
- A. Identify and address defects and discontinuities
 - B. Perform visual inspection of welds

Learning Activities Required Outside of Class:

The students in this class will spend a minimum of 6 hours per week outside regular class time doing the following:

1. Assigned readings from the text
2. Completing the necessary assignments

Methods of Instruction:

1. Lecture and discussion
2. Group Activities/ Projects
3. Presentations
4. Guest lectures/ presentations
5. Laboratory activities
6. Class discussions

Methods of Evaluation:

1. Computational and non-computational problem-solving demonstrations
2. Skill demonstrations
3. Formative and summative examinations
4. Quizzes
5. Participation
6. Individual and group exercises and projects
7. Reports and written assignments
8. Oral Presentation

Laboratory Category: Extensive Laboratory

Pre delivery criteria: All of the following criteria are met by this lab.

1. Curriculum development for each lab.
2. Published schedule of individual laboratory activities.
3. Published laboratory activity objectives.
4. Published methods of evaluation.
5. Supervision of equipment maintenance, laboratory setup, and acquisition of lab materials and supplies.

During laboratory activity of the laboratory: All of the following criteria are met by this lab.

1. Instructor is physically present in lab when students are performing lab activities.
2. Instructor is responsible for active facilitation of laboratory learning.
3. Instructor is responsible for active delivery of curriculum.
4. Instructor is required for safety and mentoring of lab activities.
5. Instructor is responsible for presentation of significant evaluation.

Post laboratory activity of the laboratory: All of the following criteria are met by this lab.

1. Instructor is responsible for personal evaluation of significant student outcomes (lab exercises, exams, practicals, notebooks, portfolios, etc.) that become a component of the student grade that cover the majority of lab exercises performed during the course.
2. Instructor is responsible for supervision of laboratory clean-up of equipment and materials.

Supplemental Data:

TOP Code:	095650: Welding Technology
SAM Priority Code:	C: Clearly Occupational
Distance Education:	Not Applicable
Funding Agency:	Y: Not Applicable(funds not used)
Program Status:	1: Program Applicable
Noncredit Category:	Y: Not Applicable, Credit Course
Special Class Status:	N: Course is not a special class
Basic Skills Status:	N: Course is not a basic skills course

Prior to College Level:	Y: Not applicable
Cooperative Work Experience:	N: Is not part of a cooperative work experience education program
Eligible for Credit by Exam:	Yes
Eligible for Pass/No Pass:	NO
Taft College General Education:	NONE