

SAN DIEGO COMMUNITY COLLEGE DISTRICT
CONTINUING EDUCATION
COURSE OUTLINE

SECTION I

SUBJECT AREA AND COURSE NUMBER

INDT 605

COURSE TITLE

GAS METAL ARC WELDING

TYPE COURSE

NON FEE

VOCATIONAL

CATALOG COURSE DESCRIPTION

A course providing instruction in the Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW) on ferrous and non-ferrous materials. Topics to be covered include orientation, safety, equipment, measuring tools, materials, cutting, GMAW and FCAW practices and procedures. Workplace skills including math, communications and business ethics are integrated into the curriculum. Students successfully completing this course will be prepared for entry level positions. (FT)

LECTURE/LABORATORY HOURS

300

ADVISORIES

Satisfactory completion of Shielded Metal Arc Welding II; basic computer and internet search skills.

RECOMMENDED SKILL LEVEL

A sixth grade reading level, ability to communicate effectively in the English language and a working knowledge of basic math.

INSTITUTIONAL STUDENT LEARNING OUTCOMES

1. Social Responsibility
SDCE students demonstrate interpersonal skills by learning and working cooperatively in a diverse environment.

INSTITUTIONAL STUDENT LEARNING OUTCOMES (CONTINUED)

2. Effective Communication
SDCE students demonstrate effective communication skills.
3. Critical Thinking
SDCE students critically process information, make decisions, and solve problems independently or cooperatively.
4. Personal and Professional Development
SDCE students pursue short term and life-long learning goals, mastering necessary skills and using resource management and self advocacy skills to cope with changing situations in their lives.

COURSE GOALS

1. Provide the student an introduction to the principles and practices of the GMAW and FCAW used in the welding industry today.
2. Provide the student with instruction and practical experience necessary to safely perform GMAW and FCAW on projects utilizing ferrous and non-ferrous materials.
3. Introduce the GMAW and FCAW techniques and practices to assist in welding ferrous and non-ferrous material projects and repairs.
4. Enhance the student's workplace skills including soft skills, math, communications, business ethics, etc., necessary to succeed in the welding industry.
5. Prepare for a simulated fillet weld test using the FCAW in the 3-F and 4-F positions in conformance with approved procedures in D1.1 American Welding Society (AWS) Structural Welding Code - Steel.

COURSE OBJECTIVES

1. Demonstrate knowledge and skills related to safety requirements and practices utilized in the gas metal arc welding process in metal fabrication industry.
2. Utilize correct terminology of current gas metal arc welding process when communicating with instructors, staff and fellow students.
3. Set up, troubleshoot and safely operate various gas metal arc welding equipment found in welding industry today.
4. Demonstrate appropriate gas metal arc welding techniques and practices to assist in welding a steel plate, shape projects, and make repairs utilizing fillet welds to the American Welding Society acceptable standards.
5. Demonstrate workplace skills including soft skills and skills in math, communications, business ethics, etc., necessary to succeed in the welding industry.

SECTION II

COURSE CONTENT AND SCOPE

1. Program Orientation 2 hrs
 - 1.1. Course Syllabus

COURSE CONTENT AND SCOPE (CONTINUED)

- 1.2. Program overview
- 1.3. Facilities orientation

- 2. Safety Orientation and Safety Topics 30 hrs
 - 2.1. OSHA 10 simulation
 - 2.2. Right to Know
 - 2.3. Material Safety Data Sheets (MSDS)
 - 2.4. Shop safety
 - 2.5. Hand tool safety
 - 2.6. Power tool safety

- 3. GMAW and FCAW Equipment 10 hrs
 - 3.1. Personal Protective Equipment (PPE)
 - 3.2. Power source classifications
 - 3.2.1. Direct current
 - 3.2.2. Transformers
 - 3.2.3. Inverters
 - 3.2.4. Engine driven
 - 3.3. Wire Feeders
 - 3.4. Welding guns
 - 3.5. Grounding
 - 3.6. Wires for GMAW and FCAW
 - 3.6.1. Classification
 - 3.6.2. Selection
 - 3.6.3. Wire care
 - 3.7. Remote controls
 - 3.8. Equipment assembly, adjustments and disassembly
 - 3.9. Trouble shooting techniques

- 4. Using Measuring Tools 3 hrs
 - 4.1. US Customary system
 - 4.1.1. Whole numbers
 - 4.1.2. Fractions
 - 4.1.3. Decimals
 - 4.1.4. Degrees
 - 4.2. Metric system
 - 4.2.1. Millimeter
 - 4.3. Math Functions
 - 4.3.1. Addition
 - 4.3.2. Subtraction
 - 4.3.3. Multiplication
 - 4.3.4. Division
 - 4.4. Measuring tape
 - 4.5. Compass
 - 4.6. Simple caliper (in/mm)

COURSE CONTENT AND SCOPE (CONTINUED)

4.7.	Electronic measuring instruments	
5.	Ferrous and Non-ferrous materials.	5 hrs
5.1.	Material types	
5.1.1.	Ferrous	
5.1.2.	Aluminum	
5.2.	Classification of metals	
5.2.1.	AISI-SAE designation	
5.3.	Plates	
5.3.1.	Thickness measurements	
5.3.2.	Weight measurements	
5.4.	Shapes	
5.4.1.	Flat bar	
5.4.2.	Round bar	
5.4.3.	Square bar	
5.4.4.	Hex bar	
5.4.5.	Angle	
5.4.6.	Tee	
5.4.7.	Channel	
5.4.8.	I-beam	
5.4.9.	H-beam	
5.4.10.	Z-bar	
6.	Ferrous Material Cutting	10 hrs
6.1.	Hand cutting with oxy-fuel equipment	
6.1.1.	Straight cutting	
6.1.2.	Bevel cutting	
6.2.	Machine cutting with oxy-fuel equipment	
6.2.1.	Straight cutting	
6.2.2.	Bevel cutting	
7.	Ferrous and Non-ferrous Material Preparation	10 hrs
7.1.	Power tool grinding	
7.2.	Sand blasting	
8.	GMAW and FCAW Practices and Principals	230 hrs
8.1.	Welding wires	
8.1.1.	Identification of wires	
8.1.2.	Selection of wires	
8.2.	Wire characteristics and manipulation	
8.2.1.	Gas shielded (ER70S-6)	
8.2.2.	Gas shielded (ER5086)	
8.2.3.	Gas shielded (E71T-1C-H8)	
8.3.	Welding equipment	
8.3.1.	Equipment types	
8.3.2.	Equipment specifications	

COURSE CONTENT AND SCOPE (CONTINUED)

- 8.3.3. Equipment selection
- 8.4. GMAW Ferrous plate and shapes projects in all positions
 - 8.4.1.1. Fillet joints
- 8.5. GMAW Non-ferrous plate and shapes projects in all positions
 - 8.5.1.1. Fillet joints
- 8.6. FCAW Ferrous plate and shapes projects in all positions
 - 8.6.1.1. Fillet joints
- 8.7. FCAW Weld Test
 - 8.7.1.1. Fillet weld test on ferrous plate
 - 8.7.1.2. Gas shielded (E71T-1C-H8)
 - 8.7.1.3. Ferrous plate (3/8 inch thickness)
 - 8.7.1.4. 3F and 4F positions
 - 8.7.1.5. Test conformance to AWS D1.1/D1.1M, Structural Welding Code – Steel
 - 8.7.1.6. Visual Inspection to AWS Standards

APPROPRIATE READINGS

Students may be given reading assignments from the course text book, informational handouts, related trade magazines and internet articles.

WRITING ASSIGNMENTS

Typical writing assignments will include: completing assigned reports, providing written answers to assigned questions, performing arithmetic calculations as assigned and completing shop and/or job orders.

OUTSIDE ASSIGNMENTS

Students are expected to spend a minimum of one hour per day outside of the class in practice and preparation for each day in class. Appropriate assignments may include, but are not limited to: appropriate internet research, readings, preparing research reports, preparing appropriate writing assignments and studying as needed to perform successfully in class.

APPROPRIATE ASSIGNMENTS THAT DEMONSTRATE CRITICAL THINKING

Students will perform analysis and evaluation of reading and/or classroom materials and utilize this analysis in classroom discussions, writing assignments, and in performing laboratory activities. Students must select and use appropriate methods and materials needed to complete laboratory assignments.

EVALUATION

A student's grade will be based on multiple measures of performance related to the course objectives. The assessment will measure development of independent critical thinking skills and will include evaluation of the student's ability. Multiple measures may include, but are not limited to the following: quizzes, lab projects, classroom participation, and attendance.

EVALUATION (CONTINUED)

Upon successful completion of the course a Certificate of Course Completion will be issued.

Upon successful completion of this course and Flux Cored Arc Welding a Certificate of Program Completion will be issued.

METHOD OF INSTRUCTION

Methods of instruction will include, but are not limited to, lectures, demonstrations, laboratory, audio-visual presentations and computer assisted instruction. Group and individual instructions, field trips, guest speakers, job shadowing and internships/externships may also be utilized.

This course, or sections of this course, may be offered through distance education.

TEXTS AND SUPPLIES

Welding Principles and Practices, Raymond J. Sacks, Current Edition, McGraw Hill
AWS D1.1/D1.1M, Structural Welding Code - Steel, Current Edition, American Welding Society
AWS D1.2/D1.2M, Structural Welding Code - Aluminum, Current Edition American Welding Society
AWS D1.3/D1.3M, Structural Welding Code - Sheet Steel, Current Edition, American Welding Society

Periodicals:

The Fabricator Magazine
The Welding Journal
Practical Welding Today Magazine

Web Sites:

American Welding Society (AWS), (<http://www.aws.org>)
American Society for Testing and Materials (ASTM), (<http://www.astm.org>)
American Society of Mechanical Engineers (AMSE), (<http://www.asme.org>)

Supplies:

A course syllabus and relevant handouts will be supplied by the Instructor

The student will need to provide his/her pen/pencil, notebook and the following equipment:

1. Safety glasses
2. Welding hood, full face
3. Burning goggles
4. Welders cap
5. Gloves, welding, extra heavy duty, leather
6. Glove, protector, aluminum
7. Gloves, metal handling, leather
8. Filter plates, glass, shade #5, #10, #11 & #12
9. Cover plates, plastic

TEXTS AND SUPPLIES (CONTINUED)

10. Tip cleaners
11. Torch lighter
12. Wire brush, small
13. Tape measure, 25 foot, one inch wide
14. Vise grips, 10 inch
15. Soapstone holder, rectangular, with soapstone

PREPARED BY: William Borinski DATE: April 30, 2012

REVISED BY: Bob Pyle DATE: May 6, 2020

Instructors must meet all requirements stated in Policy 3100 (Student Rights, Responsibilities and Administrative Due Process), and the Attendance Policy set forth in the Continuing Education Catalog.

REFERENCES:

San Diego Community College District Policy 3100
California Community Colleges, Title 5, Section 55002
Continuing Education Catalog