

SAN DIEGO COMMUNITY COLLEGE DISTRICT  
CONTINUING EDUCATION  
COURSE OUTLINE

**SECTION I**

SUBJECT AREA AND COURSE NUMBER

INDT 611

COURSE TITLE

PIPE WELDING I

TYPE COURSE

NON FEE

VOCATIONAL

CATALOG COURSE DESCRIPTION

This is a course providing instruction in Pipe Welding using the Shielded Metal Arc Welding (SMAW) on ferrous materials. Topics include orientation, safety, measuring tools, material types, metal cutting, preparation, pipe welding 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/LABORATORYHOURS

300

ADVISORY

Satisfactory completion of Shielded Metal Arc Welding II; basic computer knowledge 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 math.

INSTITUTIONAL STUDENT LEARNING OUTCOMES

1. Social Responsibility  
SDCE students demonstrate interpersonal skills by leaning 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. Introduce the principles and practices of the shielded metal arc welding process used in the pipe welding industry today.
2. Provide the student with instruction and practical experience necessary to safely perform shielded metal arc welding on projects utilizing a steel pipes and plates.
3. Introduce shielded metal arc welding techniques and practices to assist in welding a steel pipe to steel plate and repairs utilizing fillet welds to American Welding Society acceptable standards.
4. Enhance the student's workplace skills including soft skills, math, communications, business ethics, etc., necessary to succeed in the pipe welding industry.
5. Prepare for a simulated fillet weld test using the SMAW process in the pipe 2-F, 4-F and 5-F in conformance with 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 shielded metal arc welding process in pipe welding industry.
2. Utilize correct terminology of current shielded metal arc welding process for pipe welding when communicating with instructors, staff and fellow students.
3. Set up, troubleshoot and safely operate various shielded metal arc welding equipment found in pipe welding industry today.
4. Demonstrate appropriate shielded metal arc welding techniques and practices to assist in welding a steel pipe to steel plate 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 pipe welding industry.

## SECTION II

### COURSE CONTENT AND SCOPE

- |                        |       |
|------------------------|-------|
| 1. Program Orientation | 2 hrs |
| 1.1. Course Syllabus   |       |
| 1.2. Program overview  |       |

COURSE CONTENT AND SCOPE (CONTINUED)

- 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. Shielded Metal Arc Welding Equipment (SMAW) 10 hrs
  - 3.1. Personal Protective Equipment (PPE)
  - 3.2. Power source classifications
    - 3.2.1. Alternating Current
    - 3.2.2. Direct current
    - 3.2.3. Transformers
    - 3.2.4. Inverters
    - 3.2.5. Engine driven
  - 3.3. Welding leads and connectors
  - 3.4. Electrode holders
  - 3.5. Grounding
  - 3.6. Electrodes for SMAW
    - 3.6.1. Classification
    - 3.6.2. Selection
    - 3.6.3. Electrode care
  - 3.7. Remote controls
  - 3.8. Equipment assembly and adjustments
  - 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)
  - 4.7. Electronic measuring instruments

COURSE CONTENT AND SCOPE (CONTINUED)

5. Ferrous Pipe Materials.	5 hrs
5.1. Material types	
5.1.1. Ferrous	
5.2. Classification of metals	
5.2.1. AISI-SAE designation	
5.3. Pipe measurements	
5.3.1. Thickness measurements	
5.3.2. Weight measurements	
5.4. Butt welded fittings	
5.4.1. Flanges	
5.4.2. Elbows	
5.4.3. Tees	
5.4.4. Reducers	
5.4.5. Caps	
6. 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. Material Preparation	10 hrs
7.1. Power tool grinding	
7.2. Sand blasting	
8. Pipe Welding Practices and Procedures with SMAW	230 hrs
8.1. SMAW practices and principals	
8.2. Pipe practices and procedures	
8.3. Electrode characteristics and manipulation	
8.3.1. E-60XX series	
8.3.2. E-70XX series	
8.4. Steel pipe projects in all positions	
8.4.1. Fillet joints	
8.5. Weld Test	
8.5.1. Welding codes and guidelines	
8.5.2. Simulated fillet weld test on ferrous plate	
8.5.2.1. E-6011 electrode root pass	
8.5.2.2. E-7018 electrode cover pass	
8.5.2.3. 6 inch diameter ferrous pipe (sch. 40)	
8.5.2.4. 2-F, 4-F and 5-F positions	
8.5.3. 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.

### 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.

### 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.

### 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.

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

Upon successful completion of this course and Pipe Welding II 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.

### TEXT AND SUPPLIES

*Welding Principles and Practices*, Raymond J. Sacks, Current Edition, McGraw Hill  
*Pipe Welding Procedures*, Hoobasarl Rampaul, Current Edition, Industrial Press

*The Pipe Fitter's and Pipe Welder's Handbook*, Thomas W. Frankland, Current Edition, McGraw Hill

TEXT AND SUPPLIES (CONTINUED)

*ANSI Z49.1: Safety in Welding, Cutting, and Allied Processes*, Current Edition

*AWS D10.11M/D10.11: Guide for Root Pass Welding of Pipe Without Backing*, Current Edition

*AWS D10.12M/D10.12: Guide for Welding Mild Steel Pipe*, Current Edition

*API 1104, Welding of Pipelines and Related Facilities*, Current Edition

*Section IX, ASME Boiler & Pressure Vessel Code*, Current Edition

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>)

American Petroleum Institute (API), <http://www.api.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, heavy duty, leather
6. Gloves, metal handling, leather
7. Filter plates, glass, shade #5, #10 & #11
8. Cover plates, plastic
9. Tip cleaners
10. Torch lighter
11. Wire brush, small
12. Tape measure, 25 foot, one inch wide
13. Vise grips, 10 inch
14. 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 Administration Due Process) and the attendance Policy set forth in the Continuing Education Catalog

References

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