

COURSE OUTLINE **Industrial Welding II**

Course Description

WE 151. Industrial Welding II. 6 hours credit. Prerequisite: A score at a pre-determined level on a placement instrument. This course will enable the student to recognize and apply proper fundamentals of Oxy-Fuel and Gas Tungsten Arc Welding (GTAW). The student will apply proper safety practices throughout the course.

Course Relevance

The fundamental skills acquired in this course will affect the student's workplace outcomes throughout their careers. Intrinsic core abilities will have long-term economic impact upon the student's earning capacity.

Required Materials

Selected personal safety items and tools as dictated by the instructor.

Learning Outcomes

The intention is for the student to be able to:

1. Demonstrate safety in the welding processes.
2. Demonstrate basic oxy-fuel welding, brazing and GTAW skills.
3. Explain fundamental theories of oxy-fuel welding, brazing and GTAW.

Learning PACT Skills that will be DEVELOPED and documented in this course

Through involvement in this course, the student will develop ability in the following PACT skill area(s):

Technology Skills

1. Discipline-specific technology
 - Through the use of current industry technology, the student will learn to perform specific welding procedures according to the American Welding Society (AWS) standards.

Major Summative Assessment Task(s)

These learning outcome(s) and the Learning PACT skill(s) will be demonstrated by:

1. Performing a specific AWS testing procedure selected by the department.

Course Content

- I. Skills/Competencies – Actions that are essential to achieve the course outcomes:
 - A. Perform butt joint gas weld in the flat position
 - B. Perform butt joint braze weld in the flat position
 - C. Demonstrate the set up of oxy-fuel and GTAW stations
 - D. Demonstrate the ability to field strip and name all consumable parts of a GTAW torch.

Learning Units

- I. Safety in the welding shop
 - A. Accidents
 - B. General shop safety
 - C. Safety in the welding environment
 - D. Oxy-fuel Gas Welding and cutting safety
 - E. Arc Welding and cutting safety
 - F. Resistance welding safety
 - G. Safety around welding robots
 - H. Special welding process safety

- II. GTAW equipment and supplies
 - A. The Gas Tungsten Arc Welding station
 - B. Arc Welding Power Sources for GTAW
 - C. Balanced and unbalanced AC waves
 - D. Shielding gases used with GTAW
 - E. Electrode leads and hoses used for GTAW
 - F. GTAW torches
 - G. Tungsten electrodes
 - H. Fillers metals used with GTAW

- III. Gas Tungsten Arc welding
 - A. Gas Tungsten Arc Welding principles
 - B. GTAW power sources
 - C. Setting up the GTAW station
 - D. Preparing metal for welding
 - E. Methods of starting the arc
 - F. Gas Tungsten Arc Welding techniques
 - G. Shutting down the GTAW station
 - H. Welding joints in the flat welding position
 - I. Welding joints in the horizontal welding position
 - J. Welding joints in the vertical welding position
 - K. Welding joints in the overhead welding position
 - L. Semiautomatic welding
 - M. Automatic and mechanized GTAW
 - N. GTAW troubleshooting guide

- IV. Oxy-fuel Gas Welding equipment and supplies
 - A. Complete oxy-fuel gas welding outfit
 - B. Oxygen supply
 - C. Acetylene supply
 - D. Pressure regulator principles
 - E. Welding hose
 - F. Oxyacetylene torch types
 - G. Air-acetylene torch
 - H. Welding goggles and protective clothing

- I. Torch lighters and economizers
 - J. Oxy-fuel Gas Welding supplies
- V. Oxy-fuel Gas Welding
- A. Definition of welding
 - B. Soldering and brazing
 - C. Different types of welding and cutting
 - D. Oxy-fuel Gas Welding
 - E. The oxy-fuel gas welding outfit
 - F. Torch positions and movements
 - G. Running a continuous weld pool
 - H. Butt joint welding
 - I. Lap joint welding
 - J. Outside corner joint welding
 - K. Inside corner and T-joint welding
 - L. Welding positions
 - M. Appearance of a good weld
- VI. Brazing and braze welding
- A. Brazing and braze welding principles
 - B. Joint designs for brazing and braze welding
 - C. Cleaning base metals prior to brazing or braze welding
 - D. Brazing and braze welding fluxes
 - E. Brazing filler metal alloys
 - F. Brazing and braze welding processes
 - G. Heat-resistant brazed joints
- VII. Inspecting and testing welds
- A. Nondestructive examination (NDE)
 - B. Destructive tests
 - C. Visual inspection
 - D. Magnetic particle inspection
 - E. Liquid penetration inspection
 - F. Ultrasonic testing
 - G. Eddy Current inspection
 - H. X-Ray inspection
 - I. Inspecting welds using pneumatic or hydrostatic pressure
 - J. Bend tests
 - K. Tensile test
 - L. Laboratory methods of testing welds
 - M. Impact tests
 - N. Hardness testing
 - O. Microscopic method of testing welds
 - P. Macroscopic method of testing welds
 - Q. Chemical analysis method of testing welds
 - R. The peel test

VIII. Procedures and welder qualifications

- A. Welding codes
- B. Importance of codes and specifications
- C. Welding procedure specifications
- D. Welder performance qualifications
- E. Methods of testing specimens

Learning Activities

Learning activities will be assigned to assist the student to achieve the intended learning outcomes through classroom and shop exercises, lecture and other activities at the discretion of the instructor(s).

Grade Determination

The student will be graded on learning activities and assessment tasks. Grade determinants may include the following: adequate participation (discussion), projects, and other methods of evaluation employed at the discretion of the instructor(s).