

COURSE OUTLINE **Fundamentals of Welding II**

Course Description

WE 122. Fundamentals of Welding II. 3 hours credit. Prerequisite: A score at a pre-determined level on a placement instrument and WE 116 and WE 121 or instructor approval. This course will enable the student to continue to develop proficiency in the fundamentals of shielded metal arc welding and gas metal arc welding, emphasizing various thicknesses of steel plate as well as the proper selection and preparation of applicable welding joints. The student will apply proper safety practices throughout the course.

Course Relevance

The principles learned in this course will allow the student to understand and apply proper fundamental skills and process analysis to prepare for a position in a career of welding.

Required Materials

Althouse, A.D.(2004). *Modern welding*. Tinley Park, IL: Goodheart-Willcox Company, Inc.

Learning Outcomes

The intention is for the student to be able to:

1. Demonstrate an understanding of proper procedure in joint preparation.
2. Demonstrate safety in the use of shielded metal arc and gas metal arc welding.
3. Demonstrate basic shielded metal arc and gas metal arc welding skills primarily through booth exercises and shop experiences.

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 standards and technology the student will be able to perform specific welding functions in a variety of positions with a high level of proficiency.

Major Summative Assessment Task(s)

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

1. Performing specific weld profiles using the shielded metal arc and gas metal arc welding process at a more advanced level.

Course Content

- I. Skills/Competencies – Actions that are essential to achieve the course outcomes:
 - A. Perform numerous groove weld functions with heavy wall plate in flat position with the shielded metal arc welding process using E-7018 electrodes
 - B. Perform numerous groove weld functions with heavy wall plate in vertical position with the shielded metal arc welding process using E-7018 electrodes
 - C. Perform numerous groove weld functions with heavy wall plate in overhead position with the shielded metal arc welding process using E-7018 electrodes
 - D. Perform numerous groove weld functions with heavy wall plate in the flat position using the gas metal arc welding process
 - E. Demonstrate an understanding of proper procedure in joint preparation
- II. Themes – Key recurring concepts that run throughout this course:
 - A. Safety
 - B. Quality
- III. Issues – Key areas of conflict that must be understood in order to achieve the intended outcome:
 - A. The force of gravity in relation to molten metal and various welding positions
 - B. The impact of critical welding fundamentals in relation to proper weld profiles
- IV. Concepts – Key concepts that must be understood to address the issues:
 - A. Proper joint preparation
 - B. Process analysis
 - C. Terminology
 - D. The principles of electrode manipulation

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. Inspecting and testing welds
 - A. Non-destructive Examination (NDE)
 - B. Destructive tests
 - C. Visual Inspection (VT)
 - D. Magnetic Particle Inspection (MT)
 - E. Liquid Penetrant Inspection (PT)
 - F. Ultrasonic Testing (UT)
 - G. Eddy Current Inspection (ET)
 - H. X-ray Inspection (RT)
 - 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

III. 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

IV. The welding shop

- A. Welding shop design
- B. Welding shop equipment
- C. Air ventilation and conditioning equipment
- D. Mechanical metal cutting equipment
- E. Metal-forming equipment
- F. Furnaces
- G. Overhead crane
- H. Jigs and fixtures
- I. Power tools
- J. Blast cleaning equipment
- K. Welding shop tools
- L. Welding shop equipment
- M. Weld test equipment
- N. Repair of welding equipment
- O. Welding shop policy

V. Getting and holding a job in the welding industry

- A. The future of the welding industry
- B. Welding occupations and the education required
- C. School subjects suggested for success
- D. Personal traits sought by employers
- E. Academic skills sought by employers
- F. Personal management skills sought by employers
- G. Apply for a job
- H. Factors that lead to rejection for employment
- I. Factors that can lead to termination from a job

Learning Activities

Learning activities will be hands on exercises in both booth and shop. Classroom lecture is designed to enable the student to understand the key principles in process analysis, welding fundamentals, process and electrode classification analysis, and correct use of associated equipment.

Grade Determination

The student will be graded on completion of assessment task, learning activities, adequate participation (discussion) and the final project.