

Discipline: Supply Chain Automation

Integrated Course Outline of Record

Welding XX

Welding -XX: Introduction to Welding and Cutting Processes

College:
Lecture Hours: 36
Lab Hours: 54
Units: 3.00

COURSE DESCRIPTION

Prerequisites: None

Introduces technologies in Oxy/Acetylene welding (OAW), Oxy/Acetylene cutting (OAC), Oxy/Fuel cutting (OFC), SMAW (Stick), GMAW (MIG, FCAW)) and Plasma Arc Cutting (PAC), where applicable in the welding and welding education industries. The qualification and certification standards for entry level welders as established by The American Welding Society will be covered. 36 hours of Lecture and 54 Hours of Laboratory.

SHORT DESCRIPTION FOR CLASS SCHEDULE

Introduction to welding and cutting processes.

ADVISORY ENTRY SKILLS

None.

STUDENT LEARNING OUTCOMES

Upon successful completion of the course, the students should be able to:

- List common welding processes
- Identify classification of electrodes
- Describe the SMAW (stick), GMAW (MIG), FCAW (Flux core), PAC (Plasma cutting), OAW (Oxy/Acetylene Welding) and OAC/OFC (Oxy/Acetylene cutting, Oxy/Fuel cutting) processes
- Become aware of safe welding practices and perform housekeeping duties
- Perform safety inspections of welding equipment and accessories
- Set up and operate shielded metal arc welders
- Set up and operate oxy-fuel gas cutting and heating operations
- Demonstrate ability to communicate and work cooperatively with others
- Make welds in all positions on mild steel (flat, vertical, overhead, and horizontal)
- Identify and use of constant voltage power sources, electrodes and gases

- Set up and use of the plasma arc torch
- Explain equipment set up and use

COURSE CONTENT

TOPICS

1. Safety
 - a. Personal protection equipment
 - b. Fume controls
 - c. Fire control (flammable surroundings)
 - d. Electrical shock hazard
 - e. Heat hazards
 - f. Welding preparation
2. Manual OAW (Oxy/Acetylene welding) and OAC/OFC (Oxy/Acetylene cutting and Oxy Fuel cutting) processes
 - a. Set up oxy-fuel gas welding and cutting equipment for mild steel
 - b. Fuel gasses
 - c. Perform manual oxy-fuel gas cutting by making straight cuts on mild steel
 - d. Make shape cuts on mild steel
 - e. Make bevel cuts on mild steel
 - f. Use weld washing techniques to remove weld metal using the oxy-fuel cutting
 - g. Heating with Oxy Fuel
 - h. Soldering
3. Shielded metal arc welding (SMAW, stick)
 - a. SMAW power sources
 - b. SMAW equipment and set up
 - c. Electrode uses and characteristics
 - d. Puddle control
 - e. Bead evaluation
 - f. Multi pass and directional surface welds
 - g. Weld joints
4. Gas metal arc welding (GMAW) and Flux cored arc welding (FCAW) technologies
 - a. Constant voltage power sources
 - b. GMAW equipment
 - c. GMAW electrodes
 - d. Dual shield and flux core electrodes
 - e. Shielding gases
 - f. Welding techniques
 - g. GMAW variables
 - h. Gas tungsten arc welding (GTAW)

5. Plasma arc cutting (PAC) and air arc
 - a. Equipment set up and use
 - b. Plasma cutting theory
 - c. Equipment application selection and use

6. Metals
 - a. Characteristics
 - b. Weldability
 - c. Processes
 - d. Coatings
 - e. Symbols and print reading

7. Critical Thinking
Students:
 - a. Identify, organize, plan and allocate resources to complete welding assignments
 - b. Demonstrate interpersonal skills
 - c. Acquire and use information
 - d. Understand complex interrelationships in welding technologies
 - e. Work with and understand a variety of technologies in the welding industry
 - f. Demonstrate work ethic, habits and accountability
 - g. Understand employer profitability

METHODS OF INSTRUCTION

Methods of instruction used to achieve student learning outcomes may include, but are not limited to:

- Class Lectures - Class lectures will cover information that will further students' knowledge of welding techniques, welding technology and cutting methods. Lectures will include class discussion, slide shows, drawing on the board, videos and other methods to help further the students' understanding of the subject.
- Class notebook – A notebook will be kept for the class which includes course notes, handouts and other information, which pertain to the course. The notebook will also include the syllabus and course outline.
- Welding exercises and laboratories will reinforce lectures and teach skills required in welding.
- Educational videos, and slide show presentations that accompany the information being presented to enhance the information.
- Guest speakers may be used to reinforce welding techniques and/or theory.

METHODS OF EVALUATION

Students will be evaluated for progress in and/or mastery of learning outcomes by methods of evaluation which may include, but are not limited to:

- Midterm examinations designed to assess students' mastery of practical aspects of

- welding, cutting and welding theory
- Quizzes/examinations designed to assess students' ability to recall, critically analyze and apply key of welding, cutting and welding theory
 - Final examination designed to assess students' mastery of welding, cutting and welding theory
 - Oral question and answer sessions about welding, cutting and welding theory to test the students' knowledge and understanding of welding, cutting and welding technologies
 - Laboratory exercises designed to develop hands-on-skill in welding practices
 - Student presentations designed to evaluate the students' understanding of the broader impact of welding

SAMPLE ASSIGNMENTS

Outside-of-Class Reading assignments –

Instructors may bring in outside articles for students to read and further their knowledge and understanding of welding, cutting and welding theory

Outside-of-Class Writing Assignments –

Weekly written problems and terms from the book, due back within one week of the given assignment date, focus on direct current applications. They require students to prove a working understanding of welding, cutting and welding theory.

Other Outside-of-Class Assignments –

Perform internet research, as directed in class, in preparation for labs and lectures. Then, students return printouts to turn-in for credit, or send them electronically.

COURSE MATERIALS

All materials used in this course will be periodically reviewed to ensure that they are appropriate for college level instruction. Recommended texts include:

Modern Welding 11th Edition – ISBN: 978-1-60525-795-2, Andrew D. Althouse, Carl H. Turnquist, William A. Bowditch, Kevin E. Bowditch, and Mark A. Bowditch, 2012

Modern Welding Lab Manual, 11th Edition – ISBN: 978-1-60525-797-6, Bowditch, Bowditch and Bowditch, 2012

Reference Material – Hobart Welding Guide – EW-385; Hobart Institute of Welding, 400 Trade Square East; Troy, Ohio 45373

Student Supplies - Students must provide personal welding equipment to include; safety glasses, gloves, helmet, leathers, tip cleaner, wire brush, chipping hammer, and appropriate clothing.