



Western Technical College

10442110 Robotic Welding Operation

Course Outcome Summary

Course Information

Description	Students will learn basic skills necessary to operate a robotic welder. This course touches upon safety, the fundamentals of a teach pendant and arc tool programming language, controls, positioning, commands, set-up, and recovery will be addressed. Students will be able to perform basic movements and perform simple welds upon completion and identify project applications.
Career Cluster	Manufacturing
Instructional Level	Associate Degree Courses
Total Credits	2
Total Hours	54

Textbooks

No textbook required.

Success Abilities

1. Cultivate Passion: Enhance Personal Connections
2. Cultivate Passion: Expand a Growth-Mindset
3. Cultivate Passion: Increase Self-Awareness
4. Live Responsibly: Develop Resilience
5. Live Responsibly: Embrace Sustainability
6. Live Responsibly: Foster Accountability
7. Refine Professionalism: Act Ethically
8. Refine Professionalism: Improve Critical Thinking

9. Refine Professionalism: Participate Collaboratively
10. Refine Professionalism: Practice Effective Communication

Course Competencies

1. Examine all aspects of safety related robotic welding.

Assessment Strategies

- 1.1. Written Objective Test
- 1.2. Skill Demonstration

Criteria

You will know you are successful when

- 1.1. you identify the safety hazard given a scenario.
- 1.2. you describe safety response related to a given emergency/scenario.
- 1.3. you label potential hazards given a cell diagram.
- 1.4. you describe the purpose of safeguarding measures.
- 1.5. you apply safety precautions consistently while working with the robotic welder.

Learning Objectives

- 1.a. Identify general robot hazards.
- 1.b. Identify electrical hazards.
- 1.c. Identify blunt force hazards.
- 1.d. Identify pinch point hazards.
- 1.e. Explore operator strain and fatigue.
- 1.f. Examine methods of safeguarding.
- 1.g. Apply welding safety principles with robotic welders.
- 1.h. Develop an awareness of surroundings related to machine safety.

2. Examine the components of a robotic welding system.

Assessment Strategies

- 2.1. Written Objective Test

Criteria

You will know you are successful when

- 2.1. you label the components of a robotic welding system given a diagram.
- 2.2. you describe the purpose or function of each part.
- 2.3. you demonstrate ability to use each component of the welding robotic system according to industry standards.

Learning Objectives

- 2.a. Identify parts of a robotic welding system (arm, controller, welding power supply, shielding gas, filler wire).
- 2.b. Identify components common to all robots.
- 2.c. Explore the purpose of each part/component.

3. Explore the types of human machine interfaces (HMI).

Assessment Strategies

- 3.1. Written Objective Test
- 3.2. Skill Demonstration

Criteria

You will know you are successful when

- 3.1. you label the controls on the operator station given a diagram.
- 3.2. you label the controls on the teaching pendant given a diagram.
- 3.3. you demonstrate the ability to operate the robot from the operator station.
- 3.4. you demonstrate the ability to operate the robot from the pendant.
- 3.5. you demonstrate the ability to prepare the welding subsystem for operation.

Learning Objectives

- 3.a. Examine the controls at the operator station.
- 3.b. Examine the controls of the teach pendant layout.
- 3.c. Examine the controls of the welding subsystem.

4. Jog the robot based on programming situation.

Assessment Strategies

- 4.1. Demonstration
- 4.2. Written Objective Test

Criteria

You will know you are successful when

- 4.1. you describe the different types of coordinates used in robotic welding.
- 4.2. you describe purpose for varying speeds on the robotic welder.
- 4.3. you explain the purpose of each type of coordinate system.
- 4.4. you demonstrate the ability to jog the robot at various speeds in various directions based on given coordinate system.

Learning Objectives

- 4.a. Explore the differences between joint movement and axis movement.
- 4.b. Identify the Right Hand Rule.
- 4.c. Examine coordinate systems: Polar, Cartesian, World, tool, and frames.
- 4.d. Examine varying travel speeds and their applications.
- 4.e. Develop the skills needed to apply the Right Hand Rule correctly.

5. Examine the principles behind motion instructions for the robot.

Assessment Strategies

- 5.1. Written Objective Test
- 5.2. Demonstration

Criteria

You will know you are successful when

- 5.1. you calculate point translations based on given scenario.
- 5.2. you determine the outcome of the robotic welder given various types of moves.
- 5.3. you program the robotic welder to move around obstacles in most efficient manner.
- 5.4. you verify programming using a test run.
- 5.5. you modify the program based on changed obstacles.

Learning Objectives

- 5.a. Record points.
- 5.b. Determine the difference for moves between recorded points for efficiency vs. moves between recorded points for application.
- 5.c. Choose the appropriate motion for the given sets of points.
- 5.d. Choose the appropriate speed for the robot based on the application.
- 5.e. Verify the programming with a test run.
- 5.f. Modify the programming based on results of the test run aka touching up points.

6. Apply welding tool action.

Assessment Strategies

- 6.1. Project

Criteria

You will know you are successful when

- 6.1. you weld a bead that meets inspection criteria.
- 6.2. you weave welds that meet inspection criteria.
- 6.3. you weld a fillet weld that meets inspection and testing criteria.
- 6.4. you weld a groove weld that meets inspection and testing criteria.
- 6.5. you apply different robotic welding skills to complete project.

Learning Objectives

- 6.a. Verify all welding components are set up.
- 6.b. Establish the welding point types and number of points for the required weld.
- 6.c. Establish welding parameters at the corresponding points.
- 6.d. Access weld schedules between the welder and the robot.
- 6.e. Access weaving schedules to practice weaving.
- 6.f. Practice weaving variables to produce a satisfactory weld.
- 6.g. Review inspection and testing criteria of fillet and groove welds.

7. Explore basic administrative functions related to controller computation.

Assessment Strategies

- 7.1. Skill Demonstration
- 7.2. Project

Criteria

You will know you are successful when

- 7.1. you identify functions and programming steps given a written program.
- 7.2. you identify the welds to construct the final project.
- 7.3. you identify the programming needed to complete the welds.
- 7.4. you program the pendant to complete the welds (project).
- 7.5. you follow industry standards of programming conventions (i.e. comments).

Learning Objectives

- 7.a. Explore variables and loops.
- 7.b. Identify comment syntax and use in programming.
- 7.c. Explore written codes and programs to identify key functions.
- 7.d. Explore programming steps needed to execute a specific function.
- 7.e. Examine the various menus and their purposes within the software.
- 7.f. Practice programming the robotic welder.

8. Explore basic maintenance requirements for the robot.

Assessment Strategies

- 8.1. Skill Demonstration
- 8.2. Written Product

Criteria

You will know you are successful when

- 8.1. you change batteries.
- 8.2. you run Torchmate to verify TPP location accuracy.
- 8.3. you clean nozzle and tip as needed.
- 8.4. you maintain clean work space.
- 8.5. you backup and restore programs and system software.

Learning Objectives

- 8.a. Change batteries.
- 8.b. Examine torch tip.
- 8.c. Run Torchmate as needed.
- 8.d. Maintain clean work space.
- 8.e. Verify system integrity after a crash.
- 8.f. Examine features of key functions related to file and software maintenance (i.e. copy, delete, print, etc.).

9. Explore the basics of fixturing in robotic welding.

Assessment Strategies

- 9.1. Skill Demonstration

Criteria

You will know you are successful when

- 9.1. you select the appropriate clamp for the application.
- 9.2. you apply the appropriate sensor or control for the application.

9.3. you determine how to hold parts that minimizes interference in the weld areas.

Learning Objectives

- 9.a. Identify ways to hold parts without interfering with the weld areas
- 9.b. Identify methods to clamp materials.
- 9.c. Identify sensors and I/O controls that are commonly used in fixturing