Western Technical College

31442302  Welding - Fabrication 1

Course Outcome Summary

Course Information

Description  A course of instruction to include the use of rulers/scales, layout and hand tools, welding joint designs, shearing and sawing materials, grinders and belt sanders and assembly projects by various welding processes. The plasma, flame tracer will be introduced.

Career Cluster  Manufacturing

Instructional Level  Technical Diploma Courses

Total Credits  2

Total Hours  72

Textbooks


Learner Supplies

Welding sateen jacket, welding work gloves (long leather gauntlet, short leather work gloves), welding helmet, leather cape and sleeves. Vendor: To be discussed in class. Required.

Tools: 25' steel tape measure, metal combination square, and scribe. Vendor: To be discussed in class. Required.

Six inch leather steel toed work books - $75.00-150.00. Vendor: To be discussed in class. Required.


Success Abilities

1. Apply mathematical concepts.
2. Demonstrate ability to think critically.
3. Demonstrate ability to value self and work ethically with others in a diverse population.
4. Make decisions that incorporate the importance of sustainability.
5. Transfer social and natural science theories into practical applications.
6. Use effective communication skills.
7. Use technology effectively.

Experiential Learning
1. Community Based Learning Project

Program Outcomes
1. Demonstrate industry recognized safety practices
2. Interpret welding drawings
3. Produce shielded metal arc welds (SMAW)
4. Produce gas metal arc welds (GMAW)
5. Produce gas tungsten arc welds (GTAW)
6. Perform thermal cutting

Course Competencies
1. **Develop bill of materials.**
   
   Assessment Strategies
   1.1. Activity
   
   Criteria
   
   **You will know you are successful when**
   1.1. you parse a blueprint in order to identify all of the different materials used in fabrication of the project.
   1.2. you organize the materials into a bill of materials list.
   1.3. you identify and differentiate different types of Structural Shapes
   1.4. you identify and differentiate different fasteners.
   
   Learning Objectives
   1.a. Identify structural shapes of materials.
   1.b. Identify fasteners
   1.c. Identify part numbers or other defining features.
   1.d. Start a list of various parts and their materials and refine it until everything is grouped by size, shape, and length and accounted for.

2. **Maximize stock material.**
   
   Assessment Strategies
   2.1. Activity
   
   Criteria
   
   **You will know you are successful when**
   2.1. you use software to produce cut lists that efficiently uses stock material sizes.
   2.2. you calculate square footage of materials needed
   2.3. you apply calculations to produce cut lists that efficiently utilize stock material sizes.
   
   Learning Objectives
   2.a. Determine stock lengths and sizes.
   2.b. Saw or plasma kerf.
   2.c. Limit waste material.
   2.d. Use linear maximization nesting software.
   2.e. Use sheet nesting software.
   2.f. Manually nest parts.

3. **Use measuring devices**
Assessment Strategies
3.1. On-the-job Performance

Criteria
You will know you are successful when
3.1. you read the correct measurement to the smallest divisions of measuring device.
3.2. you identify the appropriate measuring tool for the task

Learning Objectives
3.a. Read divisions of standard tape measure.
3.b. Operate dial caliper
3.c. Determine differences between push pull tape measure and flexible tape measure.
3.d. Find angles between two lines or surfaces with angle gauge and protractor.
3.e. Select appropriate device for a job.

4. Shear steel.

Assessment Strategies
4.1. Skill Demonstration

Criteria
You will know you are successful when
4.1. you set rake for material thickness, power up machine, set backstop distance, and cut material in the large 8’ shear.
4.2. you are able to set the backstop, power up, and cut material in the small 4’ shear.
4.3. you use measuring devices, marking devices, clamping devices, and features of the machine(s) to produce correctly sized and shaped parts.
4.4. you identify the limitations of the shears.

Learning Objectives
4.a. Use safety equipment.
4.b. Locate material of proper thickness.
4.c. Set up shear.
4.d. Use back gauge when applicable.
4.e. Shear material to proper size.
4.f. Use square to check for squareness.
4.g. Clean up and put scrap in correct area.
4.h. Use geometric principles to layout and check parts.

5. Cut material using saws or grinders.

Assessment Strategies
5.1. Skill Demonstration

Criteria
You will know you are successful when
5.1. you identify and operate the various saws and grinders available in the lab.
5.2. you recognize how size and type of material will impact which tool will work best.
5.3. you know the strengths and limitations of the various cutting tools available.
5.4. you are able to select the best cutting tool for the job.
5.5. you position and clamp or otherwise steady material for cutting.
5.6. you cut a piece of material to the correct size without damaging the material or the machine.

Learning Objectives
5.a. Use safety equipment.
5.b. Select proper blade for the material being cut.
5.c. Measure correctly accounting for kerf and any miters.
5.d. Clamp material correctly.
5.e. Tilt saw for mitre cuts.
5.f. Adjust blade speed and feed speed appropriate to the material being cut.
5.g. Clean up area.
6. **Operate CNC thermal shape cutter**

**Assessment Strategies**

6.1. Skill Demonstration

**Criteria**

*You will know you are successful when*

6.1. you power up and operate the CNC plasma table, including all the subsystems required for it to perform.
6.2. you load the table with stock material.
6.3. you cut a part correctly using a offline program or a shape library program with an efficient use of material.
6.4. you are able to develop and prepare through programming a geometric shape for cutting.

**Learning Objectives**

6.a. Use safety equipment.
6.b. Learn controls on CNC plasma table.
6.c. Identify how the different types and thicknesses of material affect the method of cutting.
6.d. Position stock material and cutting head correctly
6.e. Examine plasma and oxyfuel torch part assembly.
6.f. Set up plasma power supply or gas pressures.
6.g. Check for correct tip size for the appropriate material thickness.
6.h. Perform proper part cleanup

7. **Operate pedestal and hand grinders.**

**Assessment Strategies**

7.1. Skill Demonstration

**Criteria**

*You will know you are successful when*

7.1. you grind mild steel on pedestal grinder.
7.2. you grind in correct direction using hand grinder.
7.3. you change grinding wheels and wire cups.

**Learning Objectives**

7.a. Use safety equipment.
7.b. Change wheels and cups with and without wrenches.
7.c. Control sparks.
7.d. Grind to proper depth.
7.e. Change distance of rest on pedestal grinder.
7.f. Analyze different finishes produced by various shapes and types of abrasives
7.g. Explore what effect different material type has on the method of grinding and polishing.

8. **Operate hole making devices.**

**Assessment Strategies**

8.1. Skill Demonstration

**Criteria**

*You will know you are successful when*

8.1. you select the appropriate hole-making device.
8.2. you are able to produce the correct size and shape of hole in a piece of material.

**Learning Objectives**

8.a. Use safety equipment.
8.b. Special considerations for method of making a hole based on type of material being used.
8.c. Use hand drills, mag drills, and drill presses.
8.d. Use cooling fluids at proper times.
8.e. Drill pilot holes, if applicable.
8.f. Use proper drilling speeds.
8.g. Use twist drills, annular cutters, hole saws, countersinks, and taps.
8.h. Use hydraulic punch.
8.i. Clean up area.

9. **Operate plate/sheet roller.**

   **Assessment Strategies**

   9.1. **Activity**

   **Criteria**

   *You will know you are successful when*

   9.1. you can produce a cylinder with no flat spots and with diameters within +/- .06" of each other measured at multiple places around the circumference.

   **Learning Objectives**

   9.a. Calculate blank size to produce required cylinder size.
   9.c. Demonstrate techniques for eliminating flat spots.

10. **Demonstrate air bending.**

    **Assessment Strategies**

    10.1. **Skill Demonstration**

    **Criteria**

    *You will know you are successful when*

    10.1. you are able to turn on and operate 10' hydraulic press brake.
    10.2. you are able to produce a correctly bent part that in which the finish dimensions are +/- .06".

    **Learning Objectives**

    10.a. Use safety equipment.
    10.b. Operate the press brake in drawing mode, numerical mode, and teach mode.
    10.c. Recognize the effect different material types have on the ability to bend material and on tooling selection and bend allowance.
    10.d. Select best tooling for a job and correctly load the machine.
    10.e. Calculate bend allowances by hand and using the CNC controller on the press brake.
    10.f. Clean up area.

11. **Tack processed materials together.**

    **Assessment Strategies**

    11.1. **Demonstration**

    **Criteria**

    *You will know you are successful when*

    11.1. you lay out location marks correctly.
    11.2. you hold a part in the correct location and tack weld it while maintaining the correct geometric conditions in space.

    **Learning Objectives**

    11.a. Use safety equipment.
    11.b. Use layout devices such as wrap arounds, squares, levels, plumb bobs.
    11.c. Use various marking devices.
    11.d. Use material holding devices such as various clamps, fixtures, or removable braces.
    11.e. Set up GMAW machine for tacking.
    11.f. Determine size of tacks.
    11.g. Determine location of tacks.
    11.h. Maintain tolerances.
    11.i. Clean-up area.

12. **Weld fabrication projects.**

    **Assessment Strategies**

    12.1. **Skill Demonstration**

    **Criteria**
You will know you are successful when

12.1. you make quality welds of the correct size in the correct location.

Learning Objectives

12.a. Use safety equipment.
12.b. Determine correct weld size, location, and appropriate process.
12.c. Control warpage and distortion through welding methods.
12.d. Identify visual appearance of welds.
12.e. Repair and correct defects found in visual self inspection.
12.f. Clean up area.