

# Welding

Program Number: 31-442-1

## One-Year Technical Diploma

Manufacturing Program Cluster

Center for Construction, Manufacturing, Apprenticeship & Transportation

Program offered at Madison Campuses

For information call: (608) 246-6102 or  
(800) 322-6282 Ext. 6102

## About the Program

This program emphasizes hands-on training and the mastery of welding techniques with manual and semi-automatic welding processes. Students develop their technical knowledge of blueprint reading, layout, metal fabrication, metallurgy and manipulative welding skills for potential qualification or certification in oxy-fuel, stick-electrode, gas-metal arc, flux-cored arc and gas-tungsten arc processes in all positions on plate and pipe.

Welders and metal fabricators lay out, shape, form, tack and weld metal assemblies or products according to various welding codes and procedures. They produce fabricated assemblies, perform repair and maintenance welding, and work on construction projects. During fabrication of these products, students are trained in the use of hand and power tools used in the welding fabrication industry.

## Unique Requirements for Graduation

30 credits with a GPA of 2.0 (C) or above. Average of 2.0 (C) or above for specific occupational courses.

## Curriculum

|                        |   | Hrs/week  |         |
|------------------------|---|-----------|---------|
|                        |   | Credits   | Lec-Lab |
| <b>First Semester</b>  |   |           |         |
| 31-442-301             | Layout & Fabrication 1.....                                     | 2         | 1-3     |
| 31-442-312             | Oxy Fuel Weld/Thermal Cutting .....                             | 2         | 1-3     |
| 31-442-314             | Arc Welding Theory .....  | 2         | 1-3     |
| 31-442-315             | Basic Arc (SMAW) .....  | 2         | 1-3     |
| 31-442-318             | Gas Tungsten Arc Welding 1(GTAW/TIG).....                       | 2         | 1-3     |
| 31-442-323             | Basic Gas Metal Arc Welding (GMAW/MIG).....                     | 2         | 1-3     |
| 31-442-393             | Drawing Interpretation .....                                    | 2         | 4-0     |
| 31-804-379             | Vocational Mathematics 1 .....                                  | 1         | 2-0     |
| <b>Semester Total</b>  |   | <b>15</b> |         |
| <b>Second Semester</b> |   |           |         |
| 31-442-316             | Arc Welding (SMAW) Horizontal .....                             | 1         | 1-1     |
| 31-442-320             | Welding Occupational Development .....                          | 1         | 2-0     |
| 31-442-321             | Arc Welding (SMAW) Vertical .....                               | 2         | 1-3     |
| 31-442-322             | Advanced Welding Techniques .....                               | 2         | 1-3     |
| 31-442-302             | Layout and Fabrication 2 .....                                  | 2         | 1-3     |
| 31-442-326             | Flux Cored & Advanced<br>Gas Metal Arc Welding (FCAW/GMAW)..... | 2         | 1-3     |
| 31-442-328             | Gas Tungsten Arc Welding 2 (GTAW/TIG).....                      | 2         | 1-3     |
| 31-442-390             | Fundamentals of Metallurgy .....                                | 2         | 4-0     |
| <b>Semester Total</b>  |   | <b>14</b> |         |

**Note:**

- Safety procedures required in all labs.
- Prerequisites can be waived with Center approval.
- Advanced standing may be gained through Center deans.
- Certain associate degree or higher post secondary courses specific to the curriculum may substitute for courses upon approval of Center deans.

*Note: Students are placed in English or mathematics courses based on their scores on the COMPASS or ASSET test or on completion of the appropriate prerequisites.*

## Program Courses

### 31-442-301 Layout and Fabrication 1 2 credits

Students perform welding fabrication techniques on common shaped products like hoods, hoppers, structural beams and manufactured products using geometric, triangulation and plate layout. Fabrication projects develop students' knowledge of hand and power tools, shearing, oxy-fuel and plasma arc hand and semi-automatic shape cutting. Calculating weld joint and bend allowances, metal forming, grinding and polishing. Layout is applied to fabrication of welded assemblies from drawings of developing a drawing and bill of materials for a part. Welding repairs and crane safety are also covered. Corequisite: 32-442-314 or consent of instructor.

### 31-442-302 Layout and Fabrication 2 2 credits

Students perform welding fabrication techniques on common shaped products like hoods, hoppers, structural beams and manufactured products using geometric, triangulation and plate layout. Fabrication projects develop students' knowledge of hand and power tools, shearing, oxy-fuel and plasma arc hand and semi-automatic shape cutting. Calculating weld joint and bend allowances, metal forming, grinding and polishing. Layout is applied to fabrication of welded assemblies from drawings of developing a drawing and bill of materials for a part. Welding repairs and crane safety are also covered. Prerequisite: 32-442-314 or consent of instructor.

### 31-442-312 Oxy Fuel Weld/Thermal Cutting 1 credit

Perform manual and semi-automatic cutting and gouging using oxy-fuel and plasma arc cutting processes. Also, oxy-fuel and plasma cutting safety and proper handling of cylinders is covered. Applications will be to English and metric dimension.

### 31-442-314 Arc Welding Theory 2 credits

Emphasizes welding theory, safe use of welding equipment, hand and power tools, oxy-fuel and plasma arc cutting, AWS joint, weld procedures, and defects and their causes. Electrical applications, effects of welding machine power sources, electrode selection and welding symbols will also be covered.

### 31-442-315 Basic Arc (SMAW) 2 credits

Students in this course will develop manipulative skills on all types of joints in the flat position using shielded metal arc welding electrodes on mild steel. Welding techniques used for structural, pipe and maintenance welding will be developed.

### 31-442-316 Arc Welding (SMAW) Horizontal 1 credit

Emphasizes shielded metal arc welding (stick arc) techniques in the horizontal position. Included are AWS fillet and groove welds using 1/8" to 5/32" diameter E-6010, iron powder and low hydrogen electrodes on welded assemblies.

### 31-442-318 Gas Tungsten Arc Welding 1 (GTAW/TIG) 2 credits

Emphasis is placed on gas tungsten arc welding (TIG) techniques of stainless steel. Development of skills and techniques on all types of joints in flat and horizontal positions. Aluminum and steel techniques may also be covered.

### 31-442-320 Welding Occupational Development 1 credit

Applications of welding terminology, use of forms, contracting, professional ethics and employment relations are studied. Specific topics germane to the welding field in decision-making, responsibility and preparation for the welding career are covered.

### 31-442-321 Arc Welding (SMAW) Vertical 2 credits

Students develop manipulative skills on all types of joints in the vertical up and down positions, using E7018 & E6010 shielded metal arc welding electrodes on mild steel. Students will also develop welding techniques used for fillet and groove weld competencies to AWS D1.1 structural steel welding code.

### 31-442-322 Advanced Welding Techniques 2 credits

Develops manipulative skills on all types of joints in the overhead and/or pipe positions using E7018 & E6010 shielded metal arc welding electrodes on mild steel. Develop welding techniques used for fillet and groove weld competencies to AWS D1.1 structural steel welding code. Course also includes air carbon arc gouging (ACC), repairs, and other advanced welding processes and applications for related trades.

### 31-442-323 Basic Gas Metal Arc Welding (GMAW/MIG) 2 credits

Students develop manipulative skills on all types of joints in the flat, horizontal and vertical up and down position using short circuiting transfer. Students will perform gas metal arc welding techniques using 1/8" to 1/2" structural fabricated parts, as per AWS code standards. Emphasis is placed on operating gas metal arc welding equipment in a safe manner and determining machine set-up for metal thickness, wire size and speed.

### 31-442-326 Flux Cored & Advanced Gas Metal Arc Welding (FCAW/GMAW) 2 credits

Continuation of development of skills and techniques on all types of joints in the flat, horizontal and vertical up and down positions, using short circuiting and spray arc transfer. Students will also learn flux-cored gas shielding and self shielding welding techniques. Mild steel, stainless steel and aluminum (1/16" to 1" thickness) are the metals used in welding joint assemblies, as per AWS code standards.

### 31-442-328 Gas Tungsten Arc Welding 2 (GTAW/TIG) 2 credits

Students develop manipulative skills on all types of joints in the flat, horizontal, vertical, over head and pipe positions. Gas tungsten arc welding of stainless, aluminum, and steel welding techniques will be covered using 1/8" to 1/32" (11 ga to 20 ga) structural fabricated parts, pipe, repair welding and for other related trades, as per AWS and ASME welding code standards.

### 31-442-390 Fundamentals of Metallurgy 2 credits

Introduction to metallurgy with emphasis on applications, selection, identification methods and alloy influences. Properties are studied utilizing testing, micro-structure interpretation and heat treatment processes. Tool steels, weld heat effects, failure analysis as well as machinability variations in cast iron, alloy steels and non-ferrous materials are covered in detail.

### 31-442-393 Drawing Interpretation 2 credits

The basic principles of engineering welding drawings are interpreted through explanation, sketching and orthographic projections. The student develops and learns the procedures of interpreting industrial welding drawings, and develops a visualization of parts and fabrication assemblies. AWS welding joints, symbols and their applications on fabricated models and company prints are also covered.

## Career Potential:

- Maintenance Welder
- Qualified Welder
- Structural Welder
- Welder/Fabricator

With additional education and/or work experience, graduates may find employment as:

- Welding Apprentice
- Welding Foreman
- Welding Inspector
- Welding Supervisor

*More detailed and updated information on this program may be available at: [matcmadison.edu](http://matcmadison.edu). The college reserves the right to make changes in the regulations and courses announced in this publication without notice.*

*Madison Area Technical College provides equal opportunity in education and employment.*

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