

## Wisconsin Technical College System Program Design

### 50-442-1 WELDING FABRICATOR APPRENTICE

#### Program Information

#### Program Description

This apprentice training program combines advanced manufacturing skills from assembly, metal fabrication, welding, and maintenance/repair into one integrated training approach. The apprenticeship model combines on-the-job learning with related instruction at Northeast Wisconsin Technical College to help develop a skilled workforce and trade. Ten program outcomes identify exit learning outcomes and performance criteria which are aligned to relevant industry standards. The exit learning outcomes were prioritized by the development team given the anticipated duration of this apprenticeship program. This apprentice program is 4 years long, and includes a minimum of 6 semesters of related instruction and the BAS Transition To Trainer course.

Assemblers and fabricators play an important role in the manufacturing process. They assemble both finished products and the pieces that go into them. The products they assemble using tools, machines, and their hands range from entire airplanes to children's toy's. They fabricate and assemble household appliances, automobiles, computers, electronic devices, and more.

Welding is the most common way of permanently joining metal parts. In this process, heat is applied to metal pieces, melting and fusing them to form a permanent bond. Because of its strength, welding is used in shipbuilding, automobile manufacturing and repair, aerospace applications, and thousands of other manufacturing activities. Welding also is used to join beams in the construction of buildings, bridges, and other structures and to join pipes in pipelines, power plants, and refineries.

Maintenance and repair of welding machines and equipment has become a critical job skill for this trade and occupation. Changes in technology have transformed manufacturing, welding, fabrication, and assembly processes. Modern manufacturing systems use robots, computers, programmable motion control devices, and various other technologies. These systems change the way in which goods are made and affect the jobs of those who make them. The more advanced assemblers, fabricators, and welders must be able to work with these new technologies and use them to produce goods.

#### External Requirements

Registered Wisconsin Apprentice

Other employer requirements

Numerous welding certifications are available, optional, and based on employer needs

#### Entry Requirements

Employer sponsorship

Journeylevel worker or other qualified individual serving as mentor

**Program Outcomes**

- 1 Adhere to welding and fabrication health & safety rules, regulations, and training covered by employers
- 2 Interpret technical drawings
- 3 Weld metals following prescribed techniques and industry standards
- 4 Produce precision fabricated parts and assemblies according to specifications
- 5 Perform advanced cutting processes
- 6 Apply principles of metallurgy to welding and fabrication operations
- 7 Perform visual inspection of welds, parts, and assemblies
- 8 Perform basic forming processes
- 9 Perform job set-up operations in order to control distortion
- 10 Apply manufacturing principles to welding and fabrication work processes

**Program Configurations**

**Welding Fabricator Apprentice Related Instruction Course Configuration**

The program configuration model for the Welder Fabricator apprenticeship related instruction provides xx semesters of coursework and the Transition-to-Trainer course in the last year. Courses listed here were developed by instructors and subject matter experts from industry. Each semester includes 72 hours of instruction (4 hours per week, or the equivalent, each term).

**Credits & Hours**

Total Credits = 12.00

Total Hours = 440 (includes Transition to Trainer at 8 hours)

**Term 1**

Course #	Course Title	Credits & Hours	Course Description
50-442-511	<b>Print Reading, Math, Cutting &amp; Inspection</b>	2.00 72 hours	This is the first course in the related instruction portion of the Welder-Fabricator Apprenticeship program. This course introduces the trade, welding and fabrication safety, print reading, trade math, metal cutting, visual inspection, and an orientation to the college and this apprenticeship program.

**Term 2**

Course #	Course Title	Credits & Hours	Course Description
50-442-522	<b>Layout &amp; Fabrication Basics with SMAW and GMAW Welding</b>	2.00 72 hours	This is the second course in the related instruction portion of the Welder-Fabricator Apprenticeship program. This course introduces fabrication and layout skills and also SMAW and GMAW welding processes.

**Term 3**

Course #	Course Title	Credits & Hours	Course Description
50-442-513	<b>Advanced Fabrication and Layout with Soldering and Brazing</b>	2.00 72 hours	This is the third course in the related instruction portion of the Welder-Fabricator Apprenticeship program. This course explores advanced fabrication techniques commonly used by metal fabrication manufacturers. Course topics include rolling, bending, forming, applied math, applied print reading, advanced layout and soldering and brazing metal.

**Term 4**

Course #	Course Title	Credits & Hours	Course Description
50-442-524	Metallurgy & FCAW and GTAW Welding	2.00 72 hours	This is the fourth course in the related instruction portion of the Welder-Fabricator Apprenticeship program. This course explores the welding procedure specifications and standards for FCAW and GTAW. Apprentices will also learn about metallurgy, distortion control, and rigging and lifting. Learning plans include both classroom activities and hands-on welding projects in both welding processes.

**Term 5**

Course #	Course Title	Credits & Hours	Course Description
50-442-515	Welding & Fabrication Troubleshooting	2.00 72 hours	This is the fifth course in the related instruction portion of the Welder-Fabricator Apprenticeship program. This course covers troubleshooting of layout, cutting, welding, and fabrication equipment. The course introduces the apprenticeship to basic troubleshooting procedures and applies those steps to specific equipment and manufacturing work processes.

**Term 6**

Course #	Course Title	Credits & Hours	Course Description
50-442-526	Automation, CNC and Lean Manufacturing	2.00 72 hours	This is the sixth course in the related instruction portion of the Welder-Fabricator Apprenticeship program. This course introduces the apprentice to CNC, automation, exotic materials, lean manufacturing, and welding standards, certifications, and qualifications.

**Term 7**

Course #	Course Title	Credits & Hours	Course Description
----------	--------------	-----------------	--------------------

47-455-455	Transition to Trainer: Your Role as a Journey Worker	0.00 8 hours	<p>Apprenticeship training is a collaborative partnership: employer and employee associations, government, and educational institutions each play a part. In reality, most learning takes place through the daily interaction between an apprentice and his/her co-workers. Surveys have shown that the apprentices are least satisfied with the on-the-job portion of their training--particularly the ability of journey level workers and supervisors to pass on their knowledge of the trade.</p> <p>You have already learned to use the tools of your chosen trade. In this workshop you will be introduced to a new set of basic tools--the tools of a jobsite trainer. You will explore the skills that are necessary to be an effective trainer, discover how to deliver hands-on training, and examine the process for giving useful feedback. During the workshop you will build a Training Toolkit to take back to your work on the job.</p>
------------	--	-----------------	---

## Wisconsin Technical College System

### 50-442-511 Print Reading, Math, Cutting & Inspection

#### Course Outcome Summary

##### Course Information

**Description** This is the first course in the related instruction portion of the Welder-Fabricator Apprenticeship program. This course introduces the trade, welding and fabrication safety, print reading, trade math, metal cutting, visual inspection, and an orientation to the college and this apprenticeship program.

**Total Credits** 2.00

##### Program Outcomes

- 1 Adhere to welding and fabrication health & safety rules, regulations, and training covered by employers
- 2 Interpret technical drawings
- 3 Weld metals following prescribed techniques and industry standards
- 4 Produce precision fabricated parts and assemblies according to specifications
- 5 Perform advanced cutting processes
- 6 Apply principles of metallurgy to welding and fabrication operations
- 7 Perform visual inspection of welds, parts, and assemblies
- 8 Perform basic forming processes
- 9 Perform job set-up operations in order to control distortion
- 10 Apply manufacturing principles to welding and fabrication work processes

##### Course Competencies

- 1 Adhere to safety rules and regulations (2 hours)
- 2 Apply math to the trade and welding-fabrication work processes (22 hours)
- 3 Interpret prints and drawings (32 hours)
- 4 Perform manual and mechanical cutting (6 hours)
- 5 Perform machine and automated cutting (6 hours)
- 6 Inspect parts, welds, and cut edges (4 hours)

## Wisconsin Technical College System

### 50-442-513 Advanced Fabrication and Layout with Soldering and Brazing

#### Course Outcome Summary

##### Course Information

**Description** This is the third course in the related instruction portion of the Welder-Fabricator Apprenticeship program. This course explores advanced fabrication techniques commonly used by metal fabrication manufacturers. Course topics include rolling, bending, forming, applied math, applied print reading, advanced layout and soldering and brazing metal.

**Total Credits** 2.00

##### **Prerequisites**

Related Instruction 1 and 2 are recommended

##### **Program Outcomes**

- 1 Adhere to welding and fabrication health & safety rules, regulations, and training covered by employers
- 2 Interpret technical drawings
- 3 Weld metals following prescribed techniques and industry standards
- 4 Produce precision fabricated parts and assemblies according to specifications
- 5 Perform advanced cutting processes
- 6 Apply principles of metallurgy to welding and fabrication operations
- 7 Perform visual inspection of welds, parts, and assemblies
- 8 Perform basic forming processes
- 9 Perform job set-up operations in order to control distortion
- 10 Apply manufacturing principles to welding and fabrication work processes

##### **Course Competencies**

- 1 Bend metals according to job specifications (8 hours)
- 2 Roll metals (8 hours)
- 3 Fabricate with structural pipe (16 hours)
- 4 Apply math to advanced fabrication processes (8 hours)
- 5 Apply prints and drawings to advanced fabrication techniques (8 hours)
- 6 Demonstrate advanced layout skills (8 hours)
- 7 Join metals using soldering and brazing techniques (16 hours)

## Wisconsin Technical College System

### 50-442-515 Welding & Fabrication Troubleshooting

#### Course Outcome Summary

##### Course Information

**Description** This is the fifth course in the related instruction portion of the Welder-Fabricator Apprenticeship program. This course covers troubleshooting of layout, cutting, welding, and fabrication equipment. The course introduces the apprenticeship to basic troubleshooting procedures and applies those steps to specific equipment and manufacturing work processes.

**Total Credits** 2.00

##### **Prerequisites**

Related Instruction 1- 4 is recommended

##### **Program Outcomes**

- 1 Adhere to welding and fabrication health & safety rules, regulations, and training covered by employers
- 2 Interpret technical drawings
- 3 Weld metals following prescribed techniques and industry standards
- 4 Produce precision fabricated parts and assemblies according to specifications
- 5 Perform advanced cutting processes
- 6 Apply principles of metallurgy to welding and fabrication operations
- 7 Perform visual inspection of welds, parts, and assemblies
- 8 Perform basic forming processes
- 9 Perform job set-up operations in order to control distortion
- 10 Apply manufacturing principles to welding and fabrication work processes

##### **Course Competencies**

- 1 Examine common principles used in industry for diagnosing and troubleshooting work processes (2 hours)
- 2 Troubleshoot layout work processes (14 hours)
- 3 Troubleshoot manual and automated cutting equipment (16 hours)
- 4 Troubleshoot fabrication machines and equipment (16 hours)
- 5 Troubleshoot welding machines and equipment (16 hours)
- 6 Operate material handling equipment properly (8 hours)

## Wisconsin Technical College System

### 50-442-522 Layout & Fabrication Basics with SMAW and GMAW Welding

#### Course Outcome Summary

##### Course Information

**Description** This is the second course in the related instruction portion of the Welder-Fabricator Apprenticeship program. This course introduces fabrication and layout skills and also SMAW and GMAW welding processes.

**Total Credits** 2.00

##### **Prerequisites**

Related Instruction 1 is recommended

##### **Program Outcomes**

- 1 Adhere to welding and fabrication health & safety rules, regulations, and training covered by employers
- 2 Interpret technical drawings
- 3 Weld metals following prescribed techniques and industry standards
- 4 Produce precision fabricated parts and assemblies according to specifications
- 5 Perform advanced cutting processes
- 6 Apply principles of metallurgy to welding and fabrication operations
- 7 Perform visual inspection of welds, parts, and assemblies
- 8 Perform basic forming processes
- 9 Perform job set-up operations in order to control distortion
- 10 Apply manufacturing principles to welding and fabrication work processes

##### **Course Competencies**

- 1 Weld metals according to SMAW standards (16 hours)
- 2 Layout jobs according to specifications (16 hours)
- 3 Fabricate metal parts according to specifications (24 hours)
- 4 Weld metals according to GMAW standards (16 hours)



## Wisconsin Technical College System

### 50-442-524 Metallurgy & FCAW and GTAW Welding

#### Course Outcome Summary

##### Course Information

**Description** This is the fourth course in the related instruction portion of the Welder-Fabricator Apprenticeship program. This course explores the welding procedure specifications and standards for FCAW and GTAW. Apprentices will also learn about metallurgy, distortion control, and rigging and lifting. Learning plans include both classroom activities and hands-on welding projects in both welding processes.

**Total Credits** 2.00

##### **Program Outcomes**

- 1 Adhere to welding and fabrication health & safety rules, regulations, and training covered by employers
- 2 Interpret technical drawings
- 3 Weld metals following prescribed techniques and industry standards
- 4 Produce precision fabricated parts and assemblies according to specifications
- 5 Perform advanced cutting processes
- 6 Apply principles of metallurgy to welding and fabrication operations
- 7 Perform visual inspection of welds, parts, and assemblies
- 8 Perform basic forming processes
- 9 Perform job set-up operations in order to control distortion
- 10 Apply manufacturing principles to welding and fabrication work processes

##### **Course Competencies**

- 1 Weld according to FCAW standards and specifications (16 hours)
- 2 Apply metallurgical principles to welding, heat treating, mechanical stresses, fabrication, and assembly work processes (32 hours)
- 3 Rig, lift, and move materials, parts, and finished goods (4 hours)
- 4 Apply distortion control techniques to job setup operations & according to job specifications (4 hours)
- 5 Weld according to GTAW standards and specifications (16 hours)

## Wisconsin Technical College System

### 50-442-526 Automation, CNC and Lean Manufacturing

#### Course Outcome Summary

##### Course Information

**Description** This is the sixth course in the related instruction portion of the Welder-Fabricator Apprenticeship program. This course introduces the apprentice to CNC, automation, exotic materials, lean manufacturing, and welding standards, certifications, and qualifications.

**Total Credits** 2.00

##### **Prerequisites**

Related Instruction 1-5 is recommended

##### **Program Outcomes**

- 1 Adhere to welding and fabrication health & safety rules, regulations, and training covered by employers
- 2 Interpret technical drawings
- 3 Weld metals following prescribed techniques and industry standards
- 4 Produce precision fabricated parts and assemblies according to specifications
- 5 Perform advanced cutting processes
- 6 Apply principles of metallurgy to welding and fabrication operations
- 7 Perform visual inspection of welds, parts, and assemblies
- 8 Perform basic forming processes
- 9 Perform job set-up operations in order to control distortion
- 10 Apply manufacturing principles to welding and fabrication work processes

##### **Course Competencies**

- 1 Operate CNC plasma arc cutting equipment (8 hours)
- 2 Operate CNC oxy-fuel cutting equipment (8 hours)
- 3 Operate automated welding equipment (8 hours)
- 4 Operate automated equipment used in metal fabrication (16 hours)
- 5 Compare thermal plastic welding to traditional welding techniques (4 hours)
- 6 Compare welding fabrication techniques for exotic metals to traditional techniques (4 hours)
- 7 Demonstrate advanced print reading for automation and CNC (8 hours)
- 8 Compare various welding standards, qualifications, and certifications (8 hours)
- 9 Summarize how welding-fabrication supports lean manufacturing (8 hours)

## Wisconsin Technical College System

### 47-455-455 Transition to Trainer: Your Role as a Journey Worker

#### Course Outcome Summary

##### Course Information

**Description** Apprenticeship training is a collaborative partnership: employer and employee associations, government, and educational institutions each play a part. In reality, most learning takes place through the daily interaction between an apprentice and his/her co-workers. Surveys have shown that the apprentices are least satisfied with the on-the-job portion of their training--particularly the ability of journey level workers and supervisors to pass on their knowledge of the trade.

You have already learned to use the tools of your chosen trade. In this workshop you will be introduced to a new set of basic tools--the tools of a jobsite trainer. You will explore the skills that are necessary to be an effective trainer, discover how to deliver hands-on training, and examine the process for giving useful feedback. During the workshop you will build a Training Toolkit to take back to your work on the job.

##### Course Competencies

- 1 Value your role as a journey worker trainer
- 2 Serve as a mentor and job coach
- 3 Foster a positive work environment by acting as an ally/advocate
- 4 Provide hands-on skills training
- 5 Provide feedback on apprentice performance