

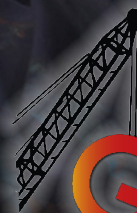
# WE BUILD

Course Catalog | 2022-23

Skills. Opportunities. Careers.

7730 W. Wackerly St, Midland, MI 48642  
5836 Executive Drive, Lansing MI 48911  
2775 Shattuck Rd, Saginaw, MI 48603  
P: 989-832-8879 / 855-832-8879

[gmcami.org](http://gmcami.org)



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BY NCCER

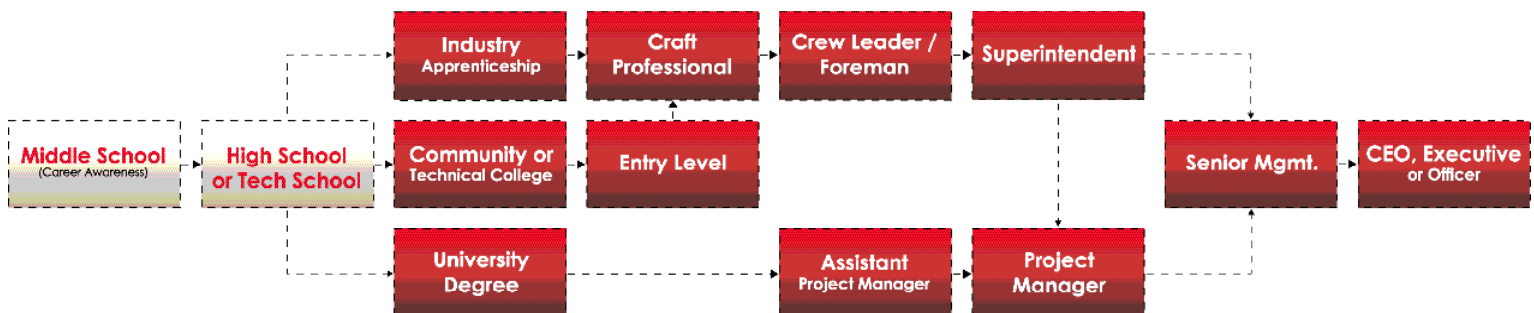
**GMCA**

Greater Michigan  
Construction Academy

# Is A Career In Construction For Me?

If the following statements apply to you, you may be suited for a rewarding career in construction!

- I prefer to work with my hands, hands-on type of work.
- I like variety in my work.
- I enjoy traveling.
- I am dependable - I miss very few days of school or work.
- I am generally on time to school or work every day.
- I enjoy being active and doing physical work.
- I enjoy working in all types of weather.
- The opportunity to continually learn new skills is appealing to me.
- When I have a job to do, I work hard at it. I am aggressive in my work, not laid back.
- I can work well and cooperatively with different personalities.
- I am able to receive instructions with a good attitude.
- I enjoy working with tools.
- I enjoy working outdoors.
- I enjoy solving a problem - my reasoning ability is superior.
- I take pride in a visible, tangible measure of my accomplishments.
- I am persistent in completing a project.
- I am self-motivated - a self-starter. I don't have to be constantly supervised.
- My math skills are pretty good / above average.
- I work well in a team environment.
- I can visualize what an abstract project will look like.
- I enjoy the flexibility of the hours that a construction job offers.



**Mission:** The Greater Michigan Construction Academy's mission is to educate through collaboration of the construction industry, their employees, and our communities. GMCA strives to develop professional workplace competencies and skills while promoting the construction industry as a career choice.

**Midland:** 7730 W. Wackerly Midland, MI 48642  
**P:** 989-832-8879 / 855-832-8879 • **F:** 989-698-3025

**Lansing:** 5836 Executive Drive, Lansing MI 48911  
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**Saginaw:** 2775 Shattuck Rd, Saginaw, MI 48603  
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# Greater Michigan Construction Academy

Greater Michigan Construction Academy (GMCA) facilitates opportunities for career growth in the construction industry through continuing education programs for craft workers, foremen, supervisors, project managers, superintendents and company management. Providing such programs is important to the construction industry to achieve knowledgeable employees and a safe work environment.

With the high demand for craft skill workers, GMCA began its training program in 1983 through Associated Builders and Contractors/Saginaw Valley Chapter. Associated Builders and Contractors, in existence for over 50 years, is a National Association representing approximately 19,000 merit shop construction and construction-related firms in 70 chapters across the United States. Now called Associated Builders and Contractors/Greater Michigan Chapter, ABC/GMC represents Merit Shop Contractors in 23 counties surrounding the Greater Michigan Area. The Greater Michigan Construction Academy is a non-profit affiliate of ABC/GMC.

Greater Michigan Construction Academy is an accredited member of the NCCER. This accreditation means GMCA has met and exceeded all the required standards of the nationally standardized program. As a result, each student is enrolled in a national teaching program that can be easily transferred among accredited sponsors and throughout the industry. GMCA students can take their transcripts to any other participating NCCER member and continue their training, having recognized documentation to reflect past classroom experiences.

More than 325 training facilities in 50 states and eight countries are proud to be NCCER Accredited Training Sponsors. Millions of craft professionals and construction managers have received quality construction education through NCCER's network of Accredited Training Sponsors and the thousands of Training Units associated with the Sponsors.

Greater Michigan Construction Academy is currently considered a non-accredited school through the Department of Education, however GMCA is a licensed Michigan Proprietary School and provides training that is approved by the Department of Labor Office of Apprenticeship (DOL/OA).

## NCCER

NCCER is a not-for-profit 501(c) 3 education foundation established by the nation's leading construction companies. NCCER was created to provide the industry with standardized construction education materials, the Contren™ Learning Series, and a system for tracking and recognizing students' training accomplishments. NCCER's National Registry. NCCER also offers accreditation, instructor certification, and skills assessments. Since its inception, NCCER has been committed to developing and maintaining a training process that is internationally recognized, standardized, portable, and competency-based.



## AWS

The American Welding Society (AWS) was founded in 1919, as a nonprofit organization with a global mission to advance the science, technology and application of welding and allied joining and cutting processes, including brazing, soldering and thermal spraying. AWS strives to move the industry forward in both thought and action, as well as inspire new generations to see the exciting career opportunities available today.



## Veterans

In 2014, the Michigan State Approving Agency (SSA), Department of Education approved The Greater Michigan Construction Academy to train VA eligible students. The Department of Veterans Affairs concurred with this approval.



## Curriculum

In cooperation with publishing partner Pearson, NCCER develops and publishes a world-class curriculum created by Subject Matter Experts representing contractors and schools from around the United States. Subject Matter Experts ensure exceptional training programs that meet or exceed national industry standards. The NCCER curriculum, which includes more than 60 craft areas, is taught worldwide by contractors, associations, construction users, and secondary and post-secondary schools. No part of the GMCA and NCCER curriculum may be reproduced in any form or by any means, including photocopying, without written permission of the publisher or developer. To receive permission please contact GMCA for instruction.

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## Craft Training

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Craft Training at the Greater Michigan Construction Academy offers students an opportunity to advance their skills as Craft Professionals. Many of the classroom components are supplemented with hands-on activities in order to advance both the student's knowledge and experience. NCCER Curriculum is modular based to ensure the student has a clear understanding of the material before he or she progresses to the next component of their training.

Upon successful completion of a training level, the student receives a certificate of completion and a wallet card. As well, Greater Michigan Construction Academy will submit the student's successful completion to NCCER where it will be recorded in the National Registry.

Students may or may not be working in their desired field in order to enroll in Greater Michigan Construction Academy. All students must be 16 years of age.

## Classroom Training For Registered Apprentices

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Greater Michigan Construction Academy classroom training is recognized as a component of a company's formal registered Apprenticeship program. For companies that have registered standards with the US Department of Labor, Office of Apprenticeship [DOL/OA], the training provided by the GMCA may fulfill the DOL/OA requirement of classroom training hours. The classroom component, along with an employer supervised 8,000 hours of on-the-job training can lead to recognition of the apprentice achieving a journey-level in their trade.

Students must be 18 years of age, capable of performing required tasks, and working for an employer who has registered standards with DOL/OA.

Students in craft or apprenticeship training will take 2 semesters per year (144 hours), in a 3, 4, or 5 year trade program to successfully complete the program.

If a student withdraws from a program without completing a level and would like to re-enroll, all modules previously passed will be considered dependent on the completion date and the amount of modules passed per 18 week semester. In order to be certified in a level, all modules must be completed within a 6 year time frame, or the full level must be taken.

## School To Career

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Students in their junior and senior year of high school, desiring to enter the skilled trades as a career, have the option of taking classes that count toward their trade training. Some classes may be offered through their local high school vocational program (if an agreement between the school and GMCA has been negotiated) or they may take the regular craft training offered by Greater Michigan Construction Academy in the evening. All requirements for high school graduation at the current grade level must be met in order to participate.

The School-To-Career program is available to any person meeting the following requirements:

- currently enrolled in high school.
- permission from local high school and parents/guardian must be obtained.
- at least 16 years of age.
- physically capable of performing the required tasks.

## Entrance Exams

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All incoming students will be required to take their entrance exam upon enrollment. This exam will allow GMCA to determine the skill level at which the students test in order to help get them placed in the appropriate class. This test will also help determine whether or not the student will need assistance in specific areas.

## Job Placement

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GMCA provides career and job placement assistance, however we do not guarantee employment. Resumes are accepted and passed along to employers looking for trades men/women (students) who are not currently working using the student referral system.

If a student is in need of assistance for resume building, the Director of Admissions & Placement Services will refer the student to numerous templates and assist with development if needed.

In order for the student to participate in the program, the job seeker must complete the ABC/GMC Student Referral Form maintained by the Director of Admissions & Placement Services. The information included consists of name, address, phone, trade, last employer, and last day worked. This form is kept on file for one semester but can be retained active through out the school year at the request of the student. The forms are classified by craft only and will not include any grades or evaluations.

When an employer has a position available, they will call the Director of Admissions & Placement Services who will maintain the listing. Once the request has been received, the manager will either fax, mail, or release to the employer or employer representative the complete list of all registered students in that specific craft. The employer can then make their selection from the list of potential candidates and call the student directly to continue the selection process if they desire.

## Consider Training Through Greater Michigan Construction Academy

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- Greater Michigan Construction Academy is a licensed Michigan Proprietary School and is compliant to state quality standards.
- Greater Michigan Construction Academy Journey person instructors have years of experience in their field of training. Some have over 25 years in practicing their trade and occupation. Many work with the students in the field, to help them learn on the job.
- Greater Michigan Construction Academy works with students and their employer to complete their craft training in a timely manner (typically four years).
- Greater Michigan Construction Academy Craft Training is certified by NCCER. If a student leaves the area, the education is transferable, portable, and recognized throughout the Nation.
- Greater Michigan Construction Academy training is recognized by the Department of Labor Bureau of Apprenticeship Training (DOL/OA). Opportunities for craft specific apprenticeships are available.
- Greater Michigan Construction Academy training deals with safety and health issues. Safe use of tools and equipment is given high priority.



## Greater Michigan Construction Academy Staff

Stephanie Davis - President  
 Angie Studer - Director of Operations & Finance  
 Bridget Sadenwater - Vice President & Director of Work-Based Learning  
 Staci Lombardo - Director of Lansing Campus  
 Carly Prudy - Director of Admissions & Placement Services  
 Emily Sadilek - Marketing & Events Coordinator  
 Kaegan Brown - Director of Administration and Special Programs  
 Stan Pardel - Director of Instructor Support  
 Dave O'Keefe - Director of Curriculum and Instruction

## 2022 Greater Michigan Construction Academy Board of Directors

Greater Michigan Construction Academy is owned and operated by Associated Builders and Contractors Greater Michigan Chapter.

Dave Mollitor - Chairman  
 Jeff Kipfmiller - Vice Chairman  
 Frank Pytlowany - Treasurer  
 Ronnie Neumann - Secretary  
 Justin Trent  
 Dan Kozakiewicz  
 Andy Bell  
 Travis Finney  
 Joe LaCross  
 Erick Forshee  
 Judd Tanzini  
 Brian Stadler  
 Dave Tebbin  
 Dave Clark

## 2022/23

## Greater Michigan Construction Academy Instructors

Carpentry - Patrick Buckley  
 Carpentry - Jeremiah Crivac  
 Carpentry - Brian Hawkins  
 Carpentry - Brandon Resmer  
 Core - Harry Fortier  
 Core - Sean Pardel  
 Core & Electrical - Tory Birchmeier  
 Core & Electrical - Craig Brussel  
 Core & Electrical - Eric Gust  
 Core & Electrical - Jon Harris  
 Core & Electrical - Greg Lombardo  
 Core & IMM - Matt Fortier  
 Core - Harry Fortier  
 Core, Carpentry & Masonry - Russ Martin  
 Core & Ironworking - Adam Purdy  
 Electrical - Robert Borchardt  
 Electrical - Niccolas Candela  
 Electrical - Chris Chamberlin  
 Electrical - Bob Champine  
 Electrical - Doug Draves  
 Electrical - Andrew Glazier  
 Electrical - Dennis Helman  
 Electrical - Michael Hutchison  
 Electrical - Becky Manson  
 Electrical - Jeff Mesler  
 Electrical - Bob Perry  
 Electrical - Tony Strachota  
 Electrical - Troy Rill  
 Electrical - Jess Ross  
 HVAC - John Huntley  
 HVAC - Kevin Stockwell  
 HVAC - David Sturgeon  
 HVAC - Justin Trent  
 Industrial Maintenance - Charles Badour  
 Industrial Maintenance - Matt Fortier  
 Industrial Maintenance & Pipefitting - Mark Turner  
 Ironworking - Chad Yancer  
 Pipefitting - Adam Fellows  
 Pipefitting - Austin Krawczak  
 Pipefitting - Troy Hinson  
 Plumbing - Ralph Czolgosz  
 Plumbing - Chad Grennell  
 Plumbing - Loren Krause  
 Plumbing - Mark Lawler  
 Plumbing - Lloyd Schweinsberg  
 Plumbing - AnnaLisa Tanner  
 Sheet Metal - Glenn Grasley  
 Welding - Steven Hilliker  
 Welding - Kathy Warren  
 Welding - Mike Williams  
 Welding - Tom Woods



# CORE CURRICULUM

1 semester = 72 class hours  
Tuition: \$1,500 per semester  
INTRODUCTORY CRAFT SKILLS (Pre-requisite for all programs)  
Instructor - Student ratio 1:25

## MODULES

### **Basic Safety (12.5 Hours)**

Presents basic job site safety information to prepare workers for the construction environment. Describes the common causes of workplace incidents and accidents and how to avoid them. Introduces common personal protective equipment, including equipment required for work at height, and its proper use. Information related to safety in several specific environments, including welding areas and confined spaces, is also provided.

### **Introduction to Construction Math (10 Hours)**

Reviews basic math skills related to the construction trades and demonstrates how they relate to the trades. Covers multiple systems of measurement, decimals, fractions, and basic geometry.

### **Introduction to Hand Tools (10 Hours)**

Introduces common hand tools used in a variety of construction crafts. Identifies tools and how to safely use them. Also presents proper hand tool maintenance.

### **Introduction to Power Tools (10 Hours)**

Identifies and describes the operation of many power tools common in the construction environment. Provides instruction on proper use, as well as safe-handling guidelines and basic maintenance.

### **Introduction to Construction Drawings (10 Hours)**

Introduces the basic terms, components, and symbols of construction drawings, as well as the most common drawing types. Also covers the interpretation and use of drawing dimensions.

### **Introduction to Basic Rigging (7.5 Elective Hours)**

Provides basic information related to rigging and rigging hardware, such as slings, rigging hitches, and hoists. Emphasizes safe working habits in the vicinity of rigging operations.

### **Basic Communication Skills (7.5 Hours)**

Provides techniques for effective communication on the job. Includes examples that emphasize the importance of both written and verbal communication skills. Describes the importance of reading skills in the construction industry and discusses effective telephone and e-mail communication skills.

### **Basic Employability Skills (7.5 Hours)**

Describes the opportunities offered by the construction trades. Discusses critical thinking and essential problem-solving skills. Also identifies and discusses positive social skills and presents information on computer systems and their industry applications.

### **Introduction to Materials Handling (5 Hours)**

Describes the hazards associated with handling materials and provides techniques to avoid both injury and property damage. Also introduces common material-handling equipment.







# CARPENTRY

## PROGRAM HOURS

Total = 576 hours

Core = 72 hours

Lab 42 hours | Lecture 30 hours

Level 1 = 72 hours

Lab 47 hours | Lecture 25 hours

Level 2 = 144 hours

Lab 94 hours | Lecture 50 hours

Level 3 = 144 hours

Lab 94 hours | Lecture 50 hours

Level 4 = 144 hours

Lab 94 hours | Lecture 50 hours

## Carpentry

Commercial and Industrial Carpenters construct, erect, install, and repair structures and fixtures. These carpenters are involved in many different kinds of construction, from buildings to highways and bridges to power plants.

### LEVEL ONE: 1 semester = 72 class hours

Tuition: \$1,500 per semester

Program Length: Certification (8 semesters/4 years)

Instructor - Student ratio 1:15

## MODULES

### Orientation to the Trade (5 hours)

Reviews the history of the trade, describes the apprentice program, identifies career opportunities for carpenters and construction workers, and lists the skills, responsibilities, and characteristics a worker should possess. Emphasizes the importance of safety in the construction industry.

### Building Materials, Fasteners, and Adhesives (7.5 hours)

Introduces the building materials used in construction work, including lumber, sheet materials, engineered wood products, structural concrete, and structural steel. Also describes the fasteners and adhesives used in construction work. Discusses the methods of squaring a building.

### Hand and Power Tools (7.5 hours)

Provides descriptions of hand tools and power tools used by carpenters. Emphasizes safe and proper operation, as well as care and maintenance.

### Intro. to Construction Drawings, Specifications, and Layout (20 hours)

Covers the techniques for reading and using construction drawings and specifications, with an emphasis on drawings and information relevant to the carpentry trade. Introduces quantity takeoffs.

### Floor Systems (27.5 Hours)

Covers framing basics and the procedures for laying out and constructing a wood floor using common lumber, as well as engineered building materials.

### Wall Systems (20 Hours)

Describes procedures for laying out and framing walls, including roughing-in door and window openings, constructing corners, partition, and bracing walls. Includes the procedure to estimate the materials required to frame walls.

### Ceiling Joist and Roof Framing (40 Hours)

Describes types of roofs and provides instructions for laying out rafters for gable roofs, hip roofs, and valley intersections. Covers stick-built and truss-built roofs. Includes the basics of roof sheathing installation.

## Introduction to Building Envelope Systems (12.5 Hours)

Introduces the concept of the building envelope and explains its components. Describes types of windows, skylights, and exterior doors, and provides instructions for installation.

## Basic Stair Layout (12.5 Hours)

Introduces types of stairs and common building code requirements related to stairs. Focuses on techniques for measuring and calculating rise, run, and stairwell openings, laying out stringers, and fabricating basic stairways.

### LEVEL TWO: 2 semesters = 144 class hours

Tuition: \$1,500 per semester

## MODULES

### Commercial Drawings (25 Hours)

Describes how to read and interpret a set of commercial drawings and specifications.

### Cold-Formed Steel Framing (15 Hours)

Describes the types and grades of steel framing materials, and includes instructions for selecting and installing metal framing for interior and exterior walls, loadbearing and nonbearing walls, partitions, and other applications.

### Exterior Finishing (35 Hours)

Covers the various types of exterior finish materials and their installation procedures, including wood, metal, vinyl, and fiber-cement siding.

### Thermal and Moisture Protection (7.5 Hours)

Covers the selection and installation of various types of insulating materials in walls, floors, and attics. Also covers the uses and installation practices for vapor barriers and waterproofing materials.

### Roofing Applications (25 Hours)

Describes how to properly prepare the roof deck and install roofing for residential and commercial buildings.

### Doors and Door Hardware (20 Hours)

Describes the installation of metal doors and related hardware in steel-framed, wood-framed, and masonry walls, along with their related hardware, such as locksets and door closers. Also discusses the installation of wood doors, folding doors, and pocket doors.

### Drywall Installation (15 Hours)

Describes the various types of gypsum drywall, their uses, and the fastening devices and methods used to install them. Contains detailed instructions for installing drywall on walls and ceilings using nails, drywall screws, and adhesives. Also discusses fire- and sound-rated walls.

### Drywall Finishing (17.5 Hours)

Describes the materials, tools, and methods used to finish and patch gypsum drywall. Also discussed automatic and manual taping and finishing tools.



**Suspended Ceilings (15 Hours)**

Describes the materials, layout, and installation procedures for many types of suspended ceilings used in commercial construction, as well as ceiling tiles, drywall suspension systems, and pan-type ceilings.

**Window, Door, Floor, and Ceiling Trim (25 Hours)**

Describes the different types of trim used in finish work and focuses on the proper methods for selecting, cutting, and fastening trim to achieve a professional finished appearance.

**Cabinet Installation (10 Hours)**

Provides detailed instructions for the selection and installation of base and wall cabinets and countertops.

**LEVEL THREE: 2 semesters = 144 class hours**

Tuition: \$1,500 per semester

**MODULES****Properties of Concrete (10 Hours)**

Describes the properties, characteristics, and uses of cement, aggregates, and other materials used in different types of concrete. Covers procedures for estimating concrete volume and testing freshly mixed concrete, as well as methods and materials for curing concrete.

**Rigging Equipment (10 Hours)**

Describes the use and inspection of basic equipment and hardware used in rigging, including slings, wire rope, and chains. Discusses attaching hardware such as shackles, eyebolts, and hooks, as well as rigging knots. Explains sling angles. Covers tuggers, jacks, hoists, and ratchet-lever hoists.

**Rigging Practices (15 Hours)**

Describes basic rigging and crane hazards as well as safety practices related to general rigging activities, working around power lines, and emergency response. Covers procedures for using slings and rigging pipes and valves.

**Trenching and Excavating (15 Hours)**

Provides an introduction to working in and around excavations, particularly in preparing building foundations. Describes types and bearing capacities of soils; procedures used in shoring, shielding, and sloping trenches and excavations; trenching safety requirements, including recognition of unsafe conditions; and mitigation of groundwater and rock when excavating foundations.

**Reinforcing Concrete (15 Hours)**

Explains the selection and uses of different types of reinforcing materials. Describes requirements for bending, cutting, splicing, and tying reinforcing steel and the placement of steel in footings and foundations, walls, columns, and beams and girders.

**Foundations and Slab-on-Grade (20 Hours)**

Covers basic site layout safety, tools, and methods; layout and construction of deep and shallow foundations; types of foundation forms; layout and formation

of slabs-on-grade; and forms used for curbing and paving.

**Vertical Formwork (22.5 Hours)**

Covers the applications and construction methods for types of forming and form hardware systems for walls, columns, and stairs, as well as slip and climbing forms. Provides an overview of the assembly, erection, and stripping of gang forms.

**Horizontal Formwork (15 Hours)**

Describes elevated decks and formwork systems and methods used in their construction. Covers joist, pan, beam and slab, flat slab, composite slab, and specialty form systems and provides instructions for the use of flying decks, as well as shoring and restoring systems.

**Handling and Placing Concrete (20 Hours)**

Covers tools, equipment, and procedures for safely handling, placing, and finishing concrete. Describes joints made in concrete structures and the use of joint sealants.

**Tilt-Up Wall Panels (17.5 Hours)**

Describes how tilt-up concrete construction is used and how tilt-up panels are formed, erected, and braced. Covers the installation of rebar and types of embedments used to lift and brace the panels. Also covers methods used to create architectural and decorative treatments.

**LEVEL FOUR: 2 semesters = 144 class hours**

Tuition: \$1,500 per semester

**MODULES****Site Layout One: Differential Leveling (20 Hours)**

Covers the principles, equipment, and methods used to perform differential leveling. Also covers the layout responsibilities of surveyors, field engineers, and carpenters; interpretation and use of site/plot plan drawings; use of laser instruments; and methods used for on-site communication.

**Site Layout Two - Angular Measurement (37.5 Hours)**

Covers the principles, equipment, and methods used to perform site layout tasks that require angular and distance measurements. Tasks include laying out building lines and determining elevations by trigonometric leveling. Covers the use of transits, theodolites, electronic distance measurement, and total stations. Reviews trade mathematics needed to perform calculations related to angular measurements.

**Advance Roof Systems (20 Hours)**

Covers commercial roofing materials and structures and describes the procedures for installing commercial roofing such as lap seam, standing seam, and built-up roofs.

**Advanced Wall Systems (25 Hours)**

Covers installation of a variety of finishing materials, including concrete masonry units and brick. Also covers installation of curtain walls and fire-rated commercial construction.

**Advanced Stair Systems (25 Hours)**

Provides extensive coverage of the materials and techniques used in finishing wooden staircases. Also covers a variety of stair systems used in commercial construction.

**Introduction to Construction Equipment (7.5 Hours)**

Introduces construction equipment, including the aerial lift, skid steer loader, electric power generator, compressor, compactor, and forklift. An overview of general safety, operation, and maintenance procedures is provided.

**Introduction to Oxyfuel Cutting and Arc Welding (20 Elective Hours)**

Introduces the equipment, procedures, and safety practices used in cutting steel with oxyfuel equipment, as well as shielded metal arc welding, gas-tungsten arc welding, and gas metal arc welding. Labs include practice in cutting and welding techniques.

**Site Preparation (7.5 Hours)**

Covers the planning process that precedes the start of work on a construction site, including environmental considerations, personnel issues, access roads, traffic control, permits, site safety, utilities, and crane-related concerns.

**Fundamentals of Crew Leader (20 Hours)**

While this module has been designed to assist the recently promoted crew leader, it is beneficial for anyone in management. The course covers basic leadership skills and explains different leadership styles, communication, delegating, and problem solving. Jobsite safety and the crew leader's role in safety are discussed, as well as project planning, scheduling, and estimating. Includes performance tasks to assist the learning process.





# ELECTRICAL

**PROGRAM HOURS****Total = 576 hours**

Core = 72 hours

Lab 42 hours | Lecture 30 hours

Level 1 = 72 hours

Lab 47 hours | Lecture 25 hours

Level 2 = 144 hours

Lab 94 hours | Lecture 50 hours

Level 3 = 144 hours

Lab 94 hours | Lecture 50 hours

Level 4 = 144 hours

Lab 94 hours | Lecture 50 hours

**Electrical**

Sound systems, robotics, or tinkering with wires, Electricians install and maintain all of the electrical and power systems for our homes, businesses and factories. They install and maintain the wiring and control equipment through which electricity flows. They also install and maintain electrical equipment and machines in factories and a wide range of other businesses. Electricians in large factories usually do maintenance work that is more complex.

**LEVEL ONE: 1 semester = 72 class hours**

Tuition: \$1,500 per semester

Program Length: Certification (8 semesters/4 years)

Instructor - Student ratio 1:20

**MODULES****Orientation to the Electrical Trade (2.5 Hours)**

Provides an overview of the electrical trade and discusses the career paths available to electricians.

**Electrical Safety (10 Hours)**

Covers safety rules and regulations for electricians. Teaches the necessary precautions to take for various electrical hazards found on the job. Also covers the OSHA-mandated lockout/tagout procedure.

**Introduction to Electrical Circuits (7.5 Hours)**

Introduces electrical concepts used in Ohm's law applied to DC series circuits. Covers atomic theory, electromotive force, resistance, and electric power equations.

**Electrical Theory (7.5 Hours)**

Introduces series, parallel, and series-parallel circuits. Covers resistive circuits, Kirchhoff's voltage and current laws, and circuit analysis.

**Introduction to the National Electrical Code® (7.5 Hours)**

Provides a navigational road map for using the NEC®. Introduces the layout of the NEC® and the types of information found within the code book. Allows trainees to practice finding information using an easy-to-follow procedure.

**Device Boxes (10 Hours)**

Covers the hardware and systems used by an electrician to mount and support boxes, receptacles, and other electrical components. Covers NEC® fill and pull requirements for device, pull, and junction boxes under 100 cubic inches.

**Hand Bending (10 Hours)**

Introduces conduit bending and installation. Covers the techniques for using hand-operated and step conduit benders, as well as cutting, reaming, and threading conduit.

**Raceways and Fittings (20 Hours)**

Introduces the types and applications of raceways, wireways, and ducts. Stresses the appropriate NEC® requirements.

**Conductors and Cables (10 Hours)**

Focuses on the types and applications of conductors and covers proper wiring techniques. Stresses the appropriate NEC® requirements.

**Basic Electrical Construction Drawings (7.5 Hours)**

Describes electrical prints, drawings, and symbols, and the types of information that can be found on schematics, one-lines, and wiring diagrams.

**Residential Electric Services (15 Hours)**

Covers the electrical devices and wiring techniques common to residential construction and maintenance. Allows trainees to practice making service calculations. Stresses the appropriate NEC® requirements.

**Electrical Test Equipment (5 Hours)**

Covers proper selection, inspection, and use of common electrical test equipment, including voltage testers, clamp-on ammeters, ohmmeters, multimeters, phase/motor rotation testers, and data recording equipment. Also covers safety precautions and meter category ratings.

**LEVEL TWO: 2 semesters = 144 class hours**

Tuition: \$1,500 per semester

**MODULES****Alternating Current (17.5 Hours)**

Describes forces that are characteristic of alternating-current systems and the application of Ohm's law to AC circuits.

**Motors: Theory and Application (20 Hours)**

Covers AC and DC motors including the main parts, circuits, and connections.

**Electric Lighting (15 Hours)**

Introduces principles of human vision and the characteristics of light. Focuses on the handling and installation of various types of lamps and lighting fixtures.

**Conduit Bending (15 Hours)**

Covers all types of bends in all sizes of conduit up to 6 inches. Focus is placed on mechanical, hydraulic, and electrical benders.

**Pull and Junction Boxes (12.5 Hours)**

Driven by the NEC®. Explains how to select and size pull boxes, junction boxes, and handholes.

**Conductor Installations (10 Hours)**

Covers the transportation, storage, and setup of cable reels; methods of rigging; and procedures for complete cable pulls in raceways and cable trays.

**Cable Tray (7.5 Hours)**

Focuses on NEC® installation requirements for cable tray, including cable installations.

**Conductor Terminations and Splices (7.5 Hours)**

Describes methods of terminating and splicing conductors of all types and sizes, including preparing and taping conductors.

**Grounding and Bonding (15 Hours)**

Focuses on the purpose on grounding and bonding electrical systems. Thoroughly covers NEC® requirements.

**Circuit Breakers and Fuses (12.5 Hours)**

Describes fuses and circuit breakers along with their practical applications. Also covers sizing.

**Control Systems and Fundamental Concepts (12.5 Hours)**

Gives basic descriptions of various types on contactors and relays along with their practical applications.

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**LEVEL THREE: 2 semesters = 144 class hours**

Tuition: \$1,500 per semester

**MODULES****Load Calculation – Branch Feeders and Circuits (17.5 hours)**

Explains how to calculate branch circuit and feeder loads for various residential and commercial applications.

**Conductor Selection and Calculations (15 Hours)**

Covers the various factors involved in conductor selection, including insulation types, current-carrying capacity, temperature ratings, and voltage drop.

**Practical Applications of Lighting (12.5 Hours)**

Describes specific types of incandescent, fluorescent, and HID lamps, as well as ballasts. Also covers troubleshooting and various types of lighting controls.

**Hazardous Locations (15 Hours)**

Presents the NEC® requirements for equipment installed in various hazardous locations.

**Overcurrent Protections (25 Hours)**

Explains how to size and select circuit breakers and fuses for various applications. Also covers short circuit calculations and troubleshooting.

**Distribution Equipment (12.5 Hours)**

Discusses switchboards and switchgear, including installation, grounding, and maintenance requirements. This module includes blueprints.

**Transformers (12.5 Hours)**

Discusses transformer types, construction, connections, protection, and grounding.

**Commercial Electrical Services (10 Hours)**

Covers the components, installation considerations, and NEC® requirements for various commercial services.

**Motor Calculation (12.5 Hours)**

Covers calculations required to size conductors and over current protection for motor applications.

**Voice, Data, and Video (10 Hours)**

Covers installation, termination and testing of various voice, data and video cabling systems.

**Motor Controls (12.5 Hours)**

Provides information on selecting, sizing, and installing motor controllers. Also covers control circuit pilot devices and basic relay logic.

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**LEVEL FOUR: 2 semesters = 144 class hours**

Tuition: \$1,500

**MODULES****Load Calculation – Feeders and Services (20 Hours)**

Topics include basic calculation procedures for commercial and residential applications.

**Health Care Facilities (10 Hours)**

Covers the installation of electric circuits in health care facilities, including the requirements for life safety and critical circuits.

**Standby and Emergency Systems (10 Hours)**

Explains NEC® requirements for electric generators and storage batteries.

**Basic Electronic Theory (10 Hours)**

Explains the function and operation of basic electronic devices, including semiconductors, diodes, rectifiers, and transistors.

**Fire Alarm Systems (15 Hours)**

Covers fire alarm control units, Digital Alarm Communicator Systems (DACS), wiring for alarm initiating and notification devices, and alarm system maintenance.

**Specialty Transformers (10 Hours)**

Covers various types of transformers and their applications. Also provides information on selecting, sizing, and installing these devices.

**Advanced Controls (20 Hours)**

Discusses applications and operating principles of solid-state controls, reduced-voltage starters, and adjustable frequency drives. Also covers basic troubleshooting procedures.

**HVAC Controls (15 Hours)**

Provides a basic overview of HVAC systems and their controls. Also covers electrical troubleshooting and NEC® requirements.

**Heat Tracing and Freeze Protection (10 Hours)**

Covers various heat tracing systems along with their applications and installation requirements.

**Motor Operation and Maintenance (10 Hours)**

Covers motor cleaning, testing and preventative maintenance. Also describes basic troubleshooting procedures.

**Medium-Voltage Terminations and Splices (10 Hours)**

Offers an overview of the NEC® and cable manufacturers' requirements for high voltage terminations and splices.

**Special Locations (20 Hours)**

Describes the NEC® requirements for selecting installing equipment enclosures, and devices in various special locations including places of assembly, theaters, carnivals, agricultural buildings, marinas, temporary installation, wired partitions and swimming pools.

**Fundamentals of Crew Leadership (20 Hours)**

While this module has been designed to assist the recently promoted crew leader, it is beneficial for anyone in management. The course covers basic leadership skills and explains different leadership styles, communication, delegating, and problem solving. Jobsite safety and the crew leader's role in safety are discussed, as well as project planning, scheduling, and estimating. Includes performance tasks to assist the learning process.



# HVAC (Heating | Ventilation | Air Conditioning)



## HVAC

Technicians are always piecing things together as they install, maintain, and repair heating, ventilation and air conditioning systems. HVAC covers it all: motors, compressors, pumps, fan, thermostats, and computerized switches control systems in residential, commercial, and industrial structures. Specialize in specific equipment, such as hydronics (water-based heating systems), solar panels, or commercial refrigeration.

### LEVEL ONE: 1 semester = 72 class hours

Tuition: \$1,500 per semester

Program Length: Certification (8 semesters/4 years)

Instructor - Student ratio 1:12

## MODULES

### Introduction to HVAC (7.5 Hours)

Covers the basic principles of heating, ventilating, and air conditioning, career opportunities in HVAC, and how apprenticeship programs are constructed. Basic safety principles, as well as trade licensure and EPA guidelines, are also introduced.

### Trade Mathematics (10 Hours)

Explains how to solve HVAC/R trade-related problems involving the measurement of lines, area, volume, weights, angles, pressure, vacuum, and temperature. Also includes a review of scientific notation, powers, roots, and basic algebra and geometry.

### Basic Electricity (12.5 Hours)

Introduces the concept of power generation and distribution, common electrical components, AC and DC circuits, and electrical safety as it relates to the HVAC field. Introduces reading and interpreting wiring diagrams.

### Introduction to Heating (15 Hours)

Covers the fundamentals of heating systems and the combustion process. Provides the different types and designs of gas furnaces and their components, as well as basic procedures for their installation and service.

### Introduction to Cooling (30 Hours)

Explains the fundamental operating concepts of the refrigeration cycle and identifies both primary and secondary components found in typical HVAC/R systems. Also introduces common refrigerants. Describes the principles of heat transfer and the essential pressure-temperature relationships of refrigerants. Introduces basic control concepts for simple systems.

### Introduction to Air Distribution Systems (15 Hours)

Describes the factors related to air movement and its measurement in common air distribution systems. Presents the required mechanical equipment and materials used to create air distribution systems. Introduces basic system design principles for both hot and cold climates.

### Basic Copper and Plastic Piping Practices (10 Hours)

Explains how to identify types of copper tubing and fittings used in the HVAC/R industry and how they are

## PROGRAM HOURS Total = 576 hours

Core = 72 hours

Lab 42 hours | Lecture 30 hours

Level 1 = 72 hours

Lab 47 hours | Lecture 25 hours

Level 2 = 144 hours

Lab 94 hours | Lecture 50 hours

Level 3 = 144 hours

Lab 94 hours | Lecture 50 hours

Level 4 = 144 hours

Lab 94 hours | Lecture 50 hours

mechanically joined. Also presents the identification and application of various types of plastic piping, along with their common assembly and installation practices.

### Soldering and Brazing (10 Hours)

Introduces the equipment, techniques, and materials used to safely join copper tubing through both soldering and brazing. Covers the required personal protective equipment, preparation, and work processes in detail. Also provides the procedures for brazing copper to dissimilar materials.

### Basic Carbon Steel Piping Practices (10 Hours)

Explains how to identify various carbon steel piping materials and fittings. Covers the joining and installation of threaded and grooved carbon steel piping systems, including detailed descriptions of threading and grooving techniques.

### LEVEL TWO: 2 semesters = 144 class hours

Tuition: \$1,500 per semester

## MODULES

### Alternating Current (10 Hours)

Covers transformers, single-phase and three-phase power distribution, capacitors, the theory and operation of induction motors, and the instruments and techniques used in testing AC circuits and components. Also reviews electrical safety.

### Compressors (12.5 Hours)

Explains operating principles of compressors used in comfort air conditioning and refrigeration systems. Includes installation, service, and repair procedures.

### Refrigerants and Oils (12.5 Hours)

Covers characteristics and applications of pure and blended refrigerants, and provides extensive coverage of lubricating oils used in refrigeration systems.

### Leak Detection, Evacuation, Recovery, and Charging (30 Hours)

Covers refrigerant handling and equipment servicing procedures for HVAC systems in an environmentally safe manner.

### Metering Devices (12.5 Hours)

Covers the operating principles, applications, installation, and adjustment of fixed and adjustable expansion devices used in air conditioning equipment.

### Heat Pumps (20 Hours)

Covers the principles of reverse cycle heating. Describes the operation of heat pumps and explains how to analyze heat pump control circuits. Includes heat pump installation and service procedures.

### Basic Maintenance (20 Hours)

Covers information related to maintenance-oriented materials, as well as guidelines for the inspection and periodic maintenance of various systems and accessories.



Also covers the application of gaskets and seals, as well as the adjustment of different types of belt drives. Includes information on inspection and maintenance requirements for selected equipment.

#### **Chimneys, Vents, and Flues (5 Hours)**

Covers the principles of venting fossil fuel furnaces and methods for selecting and installing vent systems for gas-fired heating equipment.

#### **Sheet Metal Duct Systems (10 Hours)**

Covers layout, fabrication, installation, and insulation of sheet metal ductwork. Also includes selection and installation of registers, diffusers, dampers, and other duct accessories.

#### **Fiberglass and Fabric Duct Systems (7.5 Hours)**

Covers the layout, fabrication, installation, and joining of fiberglass ductwork and fittings. Describes the proper methods for attaching and supporting flex duct.

#### **Commercial Airside Systems (12.5 Hours)**

Describes the systems, equipment, and operating sequences commercial airside system configurations such as constant volume single-zone and multi-zone, VVT, VAV, and dual-duct VAV.

#### **Air Quality Equipment (5 Hours)**

Covers principles, processes, and devices used to control humidity and air cleanliness, as well as devices used to conserve energy in HVAC systems.

#### **Intro to Hydronic Systems (12.5 Hours)**

Introduces hot water heating systems, focusing on safe operation of the low-pressure boilers and piping systems in residential applications.

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**LEVEL THREE: 2 semesters = 144 class hours**

Tuition: \$1,500 per semester

## **MODULES**

#### **Fasteners, Hardware, and Wiring Terminations (10 Hours)**

Covers a variety of fasteners, hardware, and wiring terminations used in HVAC systems including the installation of these components.

#### **Control Circuit and Motor Troubleshooting (30 Hours)**

Provides information and skills to troubleshoot control circuits and electric motors found in heating and cooling equipment.

#### **Troubleshooting Cooling (20 Hours)**

Provides guidance related to troubleshooting cooling systems.

#### **Troubleshooting Heat Pumps (12.5 Hours)**

Provides a thorough review of the heat pump operating cycle, and presents troubleshooting procedures for components.

#### **Troubleshooting Gas Heating (12.5 Hours)**

Covers information and skills needed to troubleshoot gas-fired furnaces and boilers.

#### **Troubleshooting Oil Heating (12.5 Hours)**

Describes the construction and operation of oil-fired heating systems and their components. Includes servicing and testing of oil furnaces and procedures for isolating and correcting oil furnace malfunctions.

#### **Troubleshooting Accessories (7.5 Hours)**

Delivers information and skills needed to troubleshoot various air treatment accessories used with heating and cooling equipment.

#### **Zoning, Ductless, and Variable Refrigerant Flow Systems (12.5 Hours)**

Introduces the information and skills needed to troubleshoot and repair zoned, ductless, and variable refrigerant flow systems.

#### **Commercial Hydronic Systems (10 Hours)**

Reviews basic properties of water and describes how water pressure is related to the movement of water through piping systems. Describes various types and components of commercial hot-water heating and chilled-water cooling systems, and examines how those systems function.

#### **Steam Systems (10 Hours)**

Focuses on the use of steam for storing and moving energy in HVAC systems. Reviews the fundamentals of water that relate to steam and describes the basic steam system cycle. Discusses a steam system's operational components—steam boilers and their accessories and controls; steam system loads, including heat exchangers/converters; and terminal devices. Steam system valves and piping are covered in detail, including common types of piping arrangements; the components of a condensate return/feedwater system; steam and condensate pipe sizing; and pressure-reducing valves and thermostatic valves.

#### **Retail Refrigeration Systems (15 Hours)**

Covers the applications, principles, and troubleshooting of retail refrigeration systems.

#### **Customer Relations (5 Hours)**

Presents the importance of establishing good relations with customers and provides guidance on how to achieve that goal. Focuses on ways for a technician to make a good first impression and describes how to communicate in a positive manner with customers. The elements of a service call and dealing with different types of problem customers are also covered.

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**LEVEL FOUR: 2 semesters = 144 class hours**

Tuition: \$1,500 per semester

## **MODULES**

#### **Water Treatment (10 Hours)**

Explains water problems encountered in heating and cooling systems and identifies water treatment methods and equipment. Covers basic water testing procedures and chemistry.

#### **Indoor Air Quality (12.5 Hours)**

Defines the issues associated with indoor air quality and its effect on the health and comfort of building occupants. Provides guidelines for performing an IAQ survey and covers the equipment and methods used to monitor and control indoor air quality.

#### **Energy Conservation Equipment (7.5 Hours)**

Covers heat recovery/reclaim devices, as well as other energy recovery equipment used to reduce energy consumption in HVAC systems.

#### **Building Management Systems (12.5 Hours)**

Explains how computers and microprocessors are used to manage zoned HVAC systems. Provides coverage of various network protocols and systems controllers, and introduces trainees to the various means of connection and system interface.

#### **System Air Balancing (15 Hours)**

Covers air properties and gas laws, as well as the use of psychrometric charts. Describes the tools, instruments, and procedures used to balance an air distribution system.

#### **System Startup and Shutdown (15 Hours)**

Presents the procedures for the startup and shutdown of hot water, steam heating, chilled water, and air handling systems. Also covers the start-up and shutdown of typical cooling towers and packaged HVAC units. The procedures for both short- and long-term shutdowns are included.

#### **Construction Drawings and Specifications (12.5 Hours)**

Teaches how to interpret drawings used in commercial construction, including mechanical drawings, specifications, shop drawings, and as-builts. Explains how to perform takeoff procedures for equipment, fittings, ductwork, and other components.

#### **Heating and Cooling System Design (22.5 Hours)**

Identifies factors that affect heating and cooling loads. Explains the process by which heating and cooling loads are calculated, and how load calculations are used in the selection of heating and cooling equipment. Covers basic types of duct systems and their selection, sizing, and installation requirements.

#### **Commercial/Industrial Refrigeration (20 Hours)**

Expands on the study of product and process refrigeration equipment by describing systems used in cold storage and food processing applications, as well as transportation refrigeration. Various types of defrost systems are covered in detail.

#### **Alternative and Specialized Heating and Cooling Systems (10 Hours)**

Describes alternative devices used to reduce energy consumption, including wood, coal, and pellet-fired systems, waste-oil heaters, geothermal heat pumps, solar heating, in-floor radiant heating, and direct-fired makeup units. Also introduces application-specific computer room environmental and air turnover systems.

#### **Fundamentals of Crew Leadership (20 Hours)**

While this module has been designed to assist the recently promoted crew leader, it is beneficial for anyone in management. The course covers basic leadership skills and explains different leadership styles, communication, delegating, and problem solving. Jobsite safety and the crew leader's role in safety are discussed, as well as project planning, scheduling, and estimating. Includes performance tasks to assist the learning process.





# INDUSTRIAL MAINTENANCE MECHANIC

## PROGRAM HOURS

Total = 576 hours

Core = 72 hours

Lab 42 hours | Lecture 30 hours

Level 1 = 72 hours

Lab 47 hours | Lecture 25 hours

Level 2 = 144 hours

Lab 94 hours | Lecture 50 hours

Level 3 = 144 hours

Lab 94 hours | Lecture 50 hours

Level 4 = 144 hours

Lab 94 hours | Lecture 50 hours

## Industrial Maintenance Mechanic

Hands-on industrial maintenance mechanic training is extensive and includes welding, rigging, working on hydraulics, pneumatics and electrics, performing general maintenance procedures.

### LEVEL ONE: 1 semester = 72 class hours

Tuition: \$1,500 per semester

Program Length: Certification (8 semesters/4 years)

Instructor - Student ratio 1:20

## MODULES

### Orientation to the Trade (2.5 hours)

Covers the history of the trade, and provides an overview of the industrial maintenance craft. Describes apprenticeship and training programs, as well as career opportunities in industrial maintenance. The responsibilities and characteristics a worker should possess are also described.

### Tools of the Trade (5 hours)

Introduces the hand and power tools used in industrial maintenance. Covers safety procedures and proper use of these tools.

### Fasteners and Anchors (5 hours)

Covers the hardware and systems used in industrial maintenance. Describes anchors and supports, their applications, and how to install them safely.

### Oxyfuel Cutting (17.5 hours)

Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and provides instructions for setting up, lighting, and using the equipment. Explains how to perform straight line cutting, piercing, beveling, washing, and gouging.

### Gaskets and Packing (10 hours)

Introduces gaskets and gasket material, packing and packing material, and types of O-ring material. Explains the use of gaskets, packing, and O-rings, and how to fabricate a gasket.

### Craft-Related Mathematics (15 hours)

Explains how to use ratios and proportions, solve basic algebra, area, volume, and circumference problems, and solve for right triangles using the Pythagorean theorem.

### Construction Drawings (12.5 hours)

Introduces plot plans, structural drawings, elevation drawings, as-built drawings, equipment arrangement drawings, P&IDs, isometric drawings, basic circuit diagrams, and detail sheets.

### Pumps and Drivers (5 hours)

Explains centrifugal, rotary, reciprocating, metering, and vacuum pump operation and installation methods, as well as types of drivers. Describes net positive suction head and cavitation.

### Valves (5 hours)

Identifies different types of valves and describes their installation as well as valve storage and handling.

### Introduction to Test Equipment (7.5 hours)

Introduces test equipment for industrial maintenance, including tachometers, pyrometers, strobe meters, voltage testers, and automated diagnostic tools.

### Material Handling and Hand Rigging (15 hours)

Introduces the equipment and techniques of material handling, and describes the procedures for rigging and communicating with riggers.

### Mobile and Support Equipment (10 hours)

Introduces the safety procedures and methods of operation for motorized support equipment, including forklifts, personnel lifts, compressors, and generators.

### Lubrication (12.5 hours)

Explains lubrication safety, storage, and classifications. Also explains selecting lubric.

### LEVEL TWO: 2 semesters = 144 class hours

Tuition: \$1,500 per semester

## MODULES

### Basic Layout (20 hours)

Discusses the tools used in layout. Explains how to lay out baselines using the arc method and 3-4-5 method.

### Introduction to Piping Components (5 hours)

Introduces chemical, compressed air, fuel oil, steam, and water systems. Explains how to identify piping systems according to color codes.

### Copper and Plastic Piping Practices (5 hours)

Covers the selection, preparation, joining, and support of copper and plastic piping and fittings.

### Introduction to Ferrous Metal Piping Practices (5 hours)

Covers iron and steel pipe and fittings and provides step-by-step instructions for cutting, threading, and joining ferrous piping.

### Identify, Install, and Maintain Valves (10 hours)

Explains how to remove and install threaded and flanged valves, how to replace valve stem O-ring and bonnet gaskets, and how to repack a valve stuffing box. Also discusses the purpose of valve packing.

### Hydrostatic and Pneumatic Testing (10 hours)

Describes non-destructive and pressure testing of systems and equipment.

### Introduction to Bearings (15 hours)

Introduces plain, ball, roller, thrust, guide, flanged, pillow block, and take-up bearings. Discusses bearing materials and designations.



**Low-Pressure Steam Systems (10 hours)**

Introduces the components and functions of basic steam systems, including boilers, steam traps, and blowdown recovery systems.

**High-Pressure Steam Systems and Auxiliaries (20 hours)**

Explains the functioning of high pressure steam systems used in industry.

**Distillation Towers and Vessels (20 hours)**

Introduces the various types and functioning of distillation towers and vessels, including recovery vessels and condensate processing.

**Heaters, Furnaces, Heat Exchangers, Cooling Towers, and Fin Fans (30 hours)**

Introduces equipment used to transfer and remove heat from systems in process.

**Introduction to Tube Work (10 hours)**

Covers the basics of working with heat exchanger and furnace tubing and tube sheets.

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**LEVEL THREE: 2 semesters = 144 class hours**

Tuition: \$1,500 per semester

**MODULES****Advanced Trade Math (30 hours)**

Explains right triangle trigonometry and its use in the trade. Also covers interpolation, equilateral and isosceles triangles and the laws of acute triangles.

**Precision Measuring Tools (20 hours)**

Explains how to select, inspect, use and care for levels, feeler gauges, calipers, micrometers, height gauges and surface plates, dial indicators, protractors, parallels and gauge blocks, trammels, and pyrometers.

**Installing Bearings (20 hours)**

Explains how to remove, troubleshoot, and install tapered, thrust, spherical roller, pillow block, and angular contact ball bearings.

**Installing Couplings (15 hours)**

Identifies various types of couplings, and covers installation procedures using the press-fit method and the interference-fit method. Also covers coupling removal procedures.

**Setting Baseplates and Prealignment (30 hours)**

Explains how to lay out and install baseplates and soleplates. Describes how to field-verify a plate installation. Covers precision leveling procedures and performing clearance installation. Also describes basic steps for setting motors and pumps.

**Conventional Alignment (30 hours)**

Covers types of misalignment, aligning couplings using a straightedge and feeler gauge, adjusting parallel and angular alignment, using a dial indicator, and eliminating coupling stress.

**Installing Belt and Chain Drives (10 hours)**

Covers the sizes, uses, and installation procedures of six types of drive belts and two types of chain drives.

**Installing Mechanical Seals (20 hours)**

Covers the function and advantages of mechanical seals, identifies parts and types of seals, and includes procedures for removing, inspecting and installing mechanical seals.

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**LEVEL FOUR: 2 semesters = 144 class hours**

Tuition: \$1,500 per semester

**MODULES****Preventive and Predictive Maintenance (10 hours)**

Explains preventive and predictive maintenance and non-destructive testing, and introduces the basic techniques for testing. Also describes lubricant analysis, and acoustic, infrared, and vibration testing.

**Advanced Blueprint Reading (25 hours)**

Describes the use of drawing sets to obtain system information. Explains the process of identifying a part of a machine for repair or replacement from a set of drawings.

**Compressors and Pneumatic Systems (35 hours)**

Describes the theory and practice of compressing and transporting gases. Explains the types and principles of compressors and compressed air treatment equipment, as well as compressed air use and safety.

**Reverse Alignment (30 hours)**

Describes preparation for dial indicator reverse alignment, and explains the procedures for setting up reverse alignment jigs. Explains graphic and mathematical techniques for aligning equipment based on reverse dial indicator measurements.

**Laser Alignment (25 hours)**

Using one example system, describes the principles of using laser alignment systems to perform alignments.

**Introduction to Supervisory Skills (15 hours)**

Introduces human resource criteria, concepts, and skills for the craftsperson desiring to advance to leadership roles.

**Troubleshooting and Repairing Pumps (10 hours)**

Explains how to inspect, troubleshoot, disassemble, assemble, and install a pump. Also describes the process of preparing for startup.

**Troubleshooting and Repairing Gearboxes (20 hours)**

Describes types and operation of gearboxes, and gearbox diagnostics. Explains how to troubleshoot, remove, and disassemble gearboxes, how to identify gear wear patterns, and how to install and maintain gearboxes.





# INSTRUMENTATION

## PROGRAM HOURS

Total = 576 hours

Core = 72 hours

Lab 42 hours | Lecture 30 hours

Level 1 = 72 hours

Lab 47 hours | Lecture 25 hours

Level 2 = 144 hours

Lab 94 hours | Lecture 50 hours

Level 3 = 144 hours

Lab 94 hours | Lecture 50 hours

Level 4 = 144 hours

Lab 94 hours | Lecture 50 hours

## Instrumentation

Instrument Fitters and Technicians perform key installation and maintenance functions across several industries and are trained in piping, tubing, fasteners, and metallurgy. Instrumentation Technicians and Fitters have to be familiar with electrical systems, craft-specific drawings, and must be experts in the hand and power tools specific to their trade.

### LEVEL ONE: 1 semester = 72 class hours

Tuition: \$1,500 per semester

Program Length: Certification (8 semesters/4 years)

Instructor - Student ratio 1:12

## MODULES

### Instrumentation Safety Practices (12.5 Hours)

Covers precautions for electrical hazards found on the job and teaches the OSHA-mandated lockout/tagout procedure. Identifies safety practices related to potentially hazardous tools and materials.

### Hand and Power Tools for Instrumentation (12.5 Hours)

Explains how to identify, inspect, use, and maintain the various hand and power tools used by instrument fitters and technicians.

### Craft-Related Mathematics (10 Hours)

Covers basic concepts of the metric system and the conversion of English units to metric units. Also reviews basic algebra, geometric figures, and calculations associated with triangles.

### Instrument Drawings and Documents - Part 1 (7.5 Hours)

Identifies and describes the types of drawings used in instrumentation work and familiarizes trainees with basic instrument symbols, lines, and abbreviations used on drawings.

### Inspect, Handle, and Store Instrumentation Materials (2.5 Hours)

Covers the methods used in receiving, inspecting, handling, and storing project-related instrumentation equipment.

### Electrical Systems for Instrumentation (12.5 Hours)

Covers basic electrical concepts and terms, DC circuit calculations, electrical measuring instruments, and electrical wiring.

### Fasteners (7.5 Hours)

Explains how to properly identify, select, and install threaded and non-threaded fasteners and anchors used in instrumentation work.

### Gaskets, O-Rings, and Packing (10 Hours)

Teaches how to recognize, select, and properly install gaskets, packing, and O-rings. Covers the various materials used in gaskets and O-rings, along with their applications and limitations.

### Lubricants, Sealants, and Cleaners (7.5 Hours)

Covers the proper use, storage, handling, and safety practices associated with various lubricants, cutting fluids, sealants, and cleaners. Includes coverage of the tools and materials used in applying lubricants and cleaning products.

### Tubing (15 Hours)

Introduces types of tubing, tubing materials, fittings, and tools. Covers proper storage and handling, cutting, deburring, reaming, bending, and joining of tubing.

### Steel Piping Practices (10 Hours)

Covers both carbon steel and stainless steel piping measuring 2" as it applies to instrumentation work. Includes instructions for calculating pipe cut length, cutting, deburring, reaming, and threading pipe.

### Hoses (7.5 Hours)

Describes different types of hoses and related fittings, along with proper storage and handling. Includes instructions for cutting hoses and installing standard reusable fittings.

### LEVEL TWO: 2 semesters = 144 class hours

Tuition: \$1,500 per semester

## MODULES

### Temperature, Pressure, Level, and Flow (15 Hours)

Examines the characteristics of temperature, pressure, level, and flow, and describes the units of measure for each variable. Introduces common devices used to measure these process variables and the basic principles of operation for each device.

### Instrument Fitter's Math (15 Hours)

Discusses the application of right triangles in bending and installing tubing and conduit as it applies to instrumentation. Shows how to use a scientific calculator in applying instrumentation piping and fitting math.

### Instrument Drawings and Documents - Part 2 (17.5 Hours)

Covers reading and interpreting piping and instrumentation drawings, loop sheets, flow diagrams, isometrics, and orthographics to enable the identification of types of instrumentation and the specifications for installation.

### Test Equipment (10 Hours)

Covers the selection, inspection, use, and maintenance of basic test equipment used in low-voltage work. Also covers specialized test equipment such as signal generators, wattmeters, cable testers, and RF analyzers.

### Panel Mounted Instruments (10 Hours)

Explains the selection of instruments to be panel-mounted, locating the instruments using drawings, and procedures for installing the instruments in the panels.



**Installing Field-Mounted Instruments (25 Hours)**

Covers selection and mounting of instruments at locations other than panels, including stand mounting, in-line mounting, structure mounting, strap mounting, and insertion mounting.

**Raceways for Instrumentation (17.5 Hours)**

Introduces raceways. Also covers identification and selection of conduit, raceways, wireways, cable trays, fittings, and NEC® requirements for installation.

**Clean, Purge, and Test Tubing and Piping Systems (10 Hours)**

Presents safe methods for cleaning, purging, blowing down, pressure testing, and leak testing tubing, piping, and hoses used in instrumentation.

**Protective Measures for Instrumentation (20 Hours)**

Covers protective measures applied in instrumentation installations, including heat tracing, chemical treatment, and insulation.

**Layout and Installation of Tubing and Piping Systems (35 Hours)**

Introduces piping and tubing layout procedures. Explains the steps in creating a hand-sketched isometric drawing that can be applied in the piping and tubing installation. Introduces methods and procedures used to measure, cut, and bend and support piping and tubing.

**Instrument Air Filters, Regulators, and Dryers (7.5 Hours)**

Presents the construction, operation, and uses of filters, regulators, and dryers. Covers identification and selection of the correct component for installation using applicable specifications and schematics.

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**LEVEL THREE: 2 semesters = 144 class hours**

Tuition: \$1,500 per semester

**MODULES****Control Valves, Actuators, and Positioners (15 Hours)**

Covers the construction and operation of various piping-system valves and actuators. Discusses the application and operation of valve positioners. Presents valve selection criteria and explains how to interpret valve and actuator markings and nameplate information.

**Detectors, Secondary Elements, Transducers, and Transmitters (25 Hours)**

Introduces instrumentation devices that detect different process variables, devices that change the variable into a transmittable form, and devices that transmit the information to another device for control or informational purposes. Covers devices that sense flow, level, temperature, and pressure, along with various types of transducers and transmitters.

**Instrumentation Electrical Circuitry (25 Hours)**

Describes various types of series and parallel circuits; resistance, inductance, and capacitance in AC circuits; DC power supplies; analog and digital signals; and common applications of electrical and electronic circuitry.

**Relays and Timers (10 Hours)**

Presents the principles of operation and applications of various relays and timers. Also reviews the selection process for these devices.

**Switches and Photoelectric Devices (10 Hours)**

Covers the principles of operation and applications of switches and photoelectric devices in the instrumentation environment.

**Terminating Conductors (20 Hours)**

Explains the methods, procedures, and standards used to terminate and test common types of conductors utilized in electrical and electronic wiring applications.

**Grounding and Shielding of Instrumentation Wiring (10 Hours)**

Teaches the basic concepts of grounding and shielding, including wire and cable identification. Defines various types of noise that can be induced into instrumentation wiring and describes the methods used to reduce or eliminate it.

**Process Control Theory (25 Hours)**

Describes the principles of process control and how various types of control loops are applied. Discusses ON-OFF and modulating control schemes. Explains how process control principles are applied to flow, level, temperature, and pressure control loops.

**Controllers (10 Hours)**

Covers the theory of operation and the application of common process controllers, including both pneumatic and electronic devices.

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**LEVEL FOUR: 2 semesters = 144 class hours**

Tuition: \$1,500 per semester

**MODULES****Instrument Calibration and Configuration (60 Hours)**

Introduces the basic concepts of calibration, including the three- and five-point methods. Addresses pneumatic, analog, and smart instrumentation calibration methods. Also covers other process control devices that require calibration.

**Proving, Commissioning, and Troubleshooting a Loop (17.5 Hours)**

Explains the three stages in readying a loop for operation: checking, proving, and commissioning. Examines the key ideas behind each step and stresses the differences. Explores troubleshooting techniques and methodologies, with an emphasis on their use during the three stages of readying a loop.

**Tuning Loops (15 Hours)**

Introduces the techniques used in tuning loops employing PID control. Includes basic tuning theory and formulas. Examines open, closed, and visual loop tuning methods.

**Digital Logic Circuits (15 Hours)**

Introduces the basic ideas of digital electronics. Presents gates, combination logic, and truth tables. Addresses memory devices, counters, and arithmetic circuits as well as the numbering systems commonly used in digital systems.

**Programmable Logic Controllers (12.5 Hours)**

Introduces PLCs and their uses in industrial control. Includes hardware components, applications, communications, number systems, and programming methods.

**Distributed Control Systems (15 Hours)**

Surveys DCS technologies, including an overview of their development. Discusses key components, fieldbuses, servers, and human-machine interfaces. Also introduces maintenance and the increasingly important aspect of DCS security.

**Analyzers and Monitors (30 Hours)**

Introduces the key concepts of chemistry, with an emphasis on their application in instrumentation. Explains crucial physical and chemical properties of matter. Discusses the different analytical methods used in industry to assess processes. Includes pH, conductivity, ORP, gas analysis, and particulate counts. Explores specific instruments and techniques.





# INSULATING

## PROGRAM HOURS

Total = 432 hours

Core = 72 hours

Lab 42 hours | Lecture 30 hours

Level 1 = 72 hours

Lab 46 hours | Lecture 25 hours

Level 2 = 144 hours

Lab 94 hours | Lecture 50 hours

Level 3 = 144 hours

Lab 94 hours | Lecture 50 hours

## Insulation

Insulators apply insulation materials to plumbing, air-handling, heating, cooling and refrigeration systems, piping equipment and pressure vessels, and walls, floors and ceilings of buildings and other structures, to prevent or reduce the passage of heat, cold, sound or fire.

### LEVEL ONE: 1 semester = 72 class hours

Tuition: \$1,500 per semester

Program Length: Certification (6 semesters/3 years)

Instructor - Student ratio 1:12

## MODULES

### Orientation (5 Hours)

Provides an overview of the insulation industry, including how and why insulation is used, safety factors related to insulation, and common insulation-specific tools.

### Trade Relations (7.5 Hours)

Discusses the importance of contracts, relationships with other members of the construction team, and effective communication.

### Tools of the Trade (7.5 Hours)

Identifies tools of the insulation trade, their proper use and care, and safety procedures for each.

### Material Handling, Storage, and Distribution (2.5 Hours)

Covers receiving, stacking, and storage of insulation materials as well as material movement.

### Characteristics of Pipe Insulation (5 Hours)

Provides an overview of different pipe types and their uses, pipe sizing methodology, and the relationship between pipe sizes and insulation sizes.

### Installing Fiberglass Pipe Insulation (30 Hours)

Describes the characteristics of fiberglass pipe insulation and the characteristics of ASJ jacketing.

### Installing Pipe Fittings, Valves and Flanges (40 Hours)

Explains insulation requirements for fittings, valves, and flanges. Provides tips for professional and economical installation.

### LEVEL TWO: 2 semesters = 144 class hours

Tuition: \$1,500 per semester

## MODULES

### Installing Flexible Foam Insulation (32.5 Hours)

Covers proper tool use and procedures for installing flexible foam insulation, including how to cut and install flexible foam insulation on pipe fittings, valves, flanges, equipment, and air ducts.

### Installing Blanket Insulation for Ducts (7.5 Hours)

Covers fiberglass blanket installation to ducts and apparatus, and discusses vapor-sealed blanket insulation facings.

### Installing Board Insulation for Ducts (20 Hours)

Covers fiberglass board insulation applications such as cutting fiberglass board insulation to fit over standing seams and stiffeners, vapor-seal applications, and cutting and installing fiberglass board insulation on round or oval ducts.

### Installing Calcium Silicate/Expanded Perlite Pipe Insulation (15 Hours)

Discusses the safe handling and storage of calcium silicate pipe insulation, how to make accurate cuts, and how to install single and double-layers of calcium silicate pipe insulation.

### Installing Mineral Wool Insulation (12.5 Hours)

Describes how to measure, cut, and score mineral wool insulation. Discusses attachments used on mineral wool, installation methods, sealing requirements, and how to use pin welding equipment.

### Installing Rigid Foam Insulation (20 Hours)

Covers the proper use of tools; handling and storage of rigid foam insulation; measuring, cutting, installing, and sealing rigid foam plastic and cellular glass insulation; cryogenic installation; expansion joints; contraction joints; and vapor stops.

### Installing Board and Block Insulation (17.5 Hours)

Covers the measuring requirements of board and block insulation; scoring, beveling, and cutting methods; and how to install board and block insulation on flat or curved surfaces and on large diameter tanks.

### Cement and Fabric Finishes & Mastics (10 Hours)

Covers the proper use of finishing tools; cleanup and protection procedures; and the limitations of cements, fabric finishes, and mastics.

### Plumbing Systems (7.5 Hours)

Covers cold and hot water plumbing systems; drainage systems in buildings; insulation requirements on plumbing systems; and piping hook-ups.

### Chilled and Hot Water Heating Systems (5 Hours)

Covers chilled and hot water heating and dual-temperature systems, including the types of pipes and equipment used in various systems and explains which systems require insulation and why.





## **MODULES**

### **Trade Math (7.5 Hours)**

Covers the use of measuring tools and scale rulers; describes how to make decimal, dimensional, and temperature conversions; and explains the use of formulas for calculating insulation surface areas of various objects.

### **Air Duct Systems (5 Hours)**

Covers the identification of various duct systems and their associated components.

### **Theory of Heat Transfer and Moisture Effects (2.5 Hours)**

Describes methods of heat transfer and moisture migration, and discusses the application of various types of insulation to slow or prevent these processes.

### **Adhesives and Their Uses (2.5 Hours)**

Covers the identification, application, and use of various types of adhesives.

### **Steam, Condensate, and Process Water Systems (5 Hours)**

Covers the identification of steam and condensate piping in buildings, and describes various steam and process water systems and their components.

### **Large Boilers, Breechings, Precipitators, and Apparatus (10 Hours)**

Describes various types of boilers and related equipment, and their insulation requirements.

### **Refrigeration and Cryogenic Systems (2.5 Hours)**

Introduces air conditioning and refrigeration systems and their insulation requirements. Also describes the special insulation requirements of extremely low-temperature cryogenic systems.

### **Specialized Insulation Systems (5 Hours)**

Describes special-application insulation systems, including low-temperature and prefabricated panels; refractory insulation; soft pads and pre-shaped removable covers; preinsulated systems; spray, foam, and pour-in-place insulation; fire stops; noise and sound control systems; and cryogenic applications.

### **Blueprints and Specifications (12.5 Hours)**

Describes how to determine the insulation requirements of a project by interpreting construction drawings. A set of blueprints is included with the Trainee module.

### **Jacketing Fabrication – Piping and Fittings (40 Hours)**

Covers the identification and applications of pipes and pipe fittings, and describes the various types of pipe and fitting jacketing, along with layout installation procedures, and securements.

### **Jacketing Fabrication – Vessels and Equipment (40 Hours)**

Covers the identification of various types of vessel and equipment jacketing, along with layout, fabrication, installation procedures, and securements.

### **Sheet Metal Lagging (12.5 Hours)**

Describes the identification and application of common sheet metal tools, discusses fabrication and installation methods, and covers flashing and sealing techniques.





# IRONWORKING

**PROGRAM HOURS****Total = 432 hours**

Core = 72 hours

Lab 42 hours | Lecture 30 hours

Level 1 = 72 hours

Lab 46 hours | Lecture 25 hours

Level 2 = 144 hours

Lab 94 hours | Lecture 50 hours

Level 3 = 144 hours

Lab 94 hours | Lecture 50 hours

**Ironworking**

Ironworkers place and install iron or steel girders, columns, and other construction materials. They must always be paying attention to details to check vertical and horizontal alignment with plumb bobs, laser equipment, transits or levels – then they bolt or weld the piece permanently in place.

**LEVEL ONE: 1 semester = 72 class hours**

Tuition: \$1,500 per semester

Program Length: Certification (6 semesters/3 years)

Instructor - Student ratio 1:12

**MODULES****Introduction to the Trade (5 Hours)**

Discusses the historical development of the ironworking trade. Explains personal qualities that contribute to successful employment. Describes the organization and purpose of apprenticeship training, and the safety obligations of the employer and employee.

**Trade Safety (12.5 Hours)**

Describes the consequences of on-the-job accidents and the responsibilities of OSHA. Identifies potential ironworker health and safety hazards and safe work practices around cranes. Explains the safe use of personnel lifts. Discusses the safe use and operation of aerial platforms, hoists, and fall protection systems.

**Tools and Equipment of the Trade (10 Hours)**

Identifies safety tools and equipment. Describes the proper use of hand and power tools. Identifies power sources for ironworking tools.

**Fastening (5 Hours)**

Explains how to recognize A-325 and A-490 bolts, washers, and nuts. Describes how to correctly tension bolts and explains procedures for calibrated wrench and turn-of-nut tightening methods.

**Mobile Construction Cranes (10 Hours)**

Identifies common lifting equipment and construction cranes. Describes how to use crane manuals, perform record keeping, and follow safety requirements. Provides procedures for assembling construction cranes.

**Rigging Equipment (10 Hours)**

Describes the use and inspection of equipment and hardware used in rigging. Describes slings and explains how to determine sling capacities and angles. Covers the selection and inspection of rigging equipment, including block and tackles, chain hoists, come-alongs, jacks, and tuggers.

**Rigging Practices (15 Hours)**

Identifies the site and environmental hazards associated with rigging. Explains how to attach rigging hardware for routine lifts and identify the components of a lift plan. Describes how to perform sling tension calculations and determine the weight of beams and basic weight estimation.

**Trade drawings One (12.5 Hours)**

Identifies the materials used in steel-framed buildings. Explains how to read basic structural blueprints.

**Structural Ironworking One (7.5 Hours)**

Identifies the types of construction that utilize structural steel, the components of the structures, and the process involved in erecting a steel structure. Explains the principles of structural stresses and the requirements of bolted connections.

**Plumbing, Aligning, and Guying (5 Hours)**

Describes the purpose and function of aligning and plumbing steel structures, the tools that are used, and the procedures for performing the plumbing and aligning. Identifies and explains column base and baseplate components and foundation failures.

**Oxyfuel Cutting (17.5 Hours)**

Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and setup requirements. Explains how to light, adjust, and shut down oxyfuel equipment. Describes straight line, piercing, bevels, washing, and gouging techniques.

**Introduction to Arc Welding (22.5 Hours)**

Identifies welding equipment and processes. Describes safety precautions associated with arc welding. Explains how to identify weld joints, their dimensions, and applications from welding symbols and drawings. Describes how to set up and use SMAW equipment and explains the governing welding codes.

**Bar Joists and Girders (5 Hours)**

Explains how to recognize types of bar joists and how they are designated. Describes the proper procedures for rigging and storing steel joists. Explains the use of joist girders in steel joist construction systems and the proper erection procedures for bar joists. Includes OSHA Subpart R.

**Metal decking (10 Hours)**

Identifies decking types and profiles and how decking is packaged, shipped, and stored. Describes erecting decking and job-site safety. Discusses the effects of deck penetrations and damage. Includes OSHA Subpart R.

**Field Fabrication (15 Hours)**

Identifies the safety hazards associated with field fabrication. Describes how to use common layout tools. Explains how to fabricate angle iron, channel, T-shapes, and W-shapes to given dimensions.



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**LEVEL TWO: 2 semesters = 144 class hours**

Tuition: \$1,500 per semester

## MODULES

### Trade Math (25 Hours)

Explains fractions, basic math, and includes multiple opportunities for practical applications.

### Weld Quality (10 Hours)

Identifies the codes that govern welding, including marine welds. Identifies and explains weld imperfections and causes. Describes non-destructive examination practices, visual inspection criteria, welder qualification tests, and the importance of quality workmanship.

### Position Arc Welding (20 Hours)

Identifies and explains weld joints, weld positions, and open V-butt welds. Describes how to prepare arc welding equipment and how to make flat welds, horizontal welds, vertical welds, and overhead welds.

### Forklifts (17.5 Hours)

Identifies the basic components of forklifts and the corresponding hand signals. Explains safe practices and how to perform inspections. Covers how to read load charts and how to operate forklifts.

### Trade drawings Two (10 Hours)

Introduces types of structural plans and describes the information included on each type. Presents the sequences of erection plans for each step of construction and identifies the symbols and abbreviations used on drawings.

### Intermediate Rigging (10 Hours)

Describes the basic procedures for using the various types of slings and for determining sling stress. Introduces the trainee to lift plans, crane load charts, determining the center of gravity of a load, and using cranes to lift personnel. Describes sling selection and the use of jacks, hoists, and rollers to move loads.

### Structural Ironworking Two (30 Hours)

Describes pre-erection activities for structural steel. Provides procedures for erecting bearing devices, columns, beams, girders, joists, bracing, and bridging.

### Steel Joists and Joist Girders (15 Hours)

Identifies the types of joists, methods of end support, and the types of bridging available. Explains how to locate the ironworking information on framing plans and describes steel joist installation procedures. Describes the conditions necessary and the benefits of penalizing bar joist.

### Tower Cranes (15 Hours)

Describes safe practices when erecting steel using tower cranes. Explains the difference between erecting steel with a mobile crane versus a tower crane. Describes tower crane hand and verbal signals.

### Survey Equipment use and Care One (10 Hours)

Identifies survey equipment and uses. Explains the proper set up and use of a builder's level and a theodolite. Covers how to shoot elevations, sweep a column for plumb, and set up over a point and back sight to another point.

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**LEVEL THREE: 2 semesters = 144 class hours**

Tuition: \$1,500 per semester

## MODULES

### Applied Trade Math (5 Hours)

Explains the math needed to calculate the size of cribbing or blocking needed for a load; parts of line, maximum load, and line pull for lifting operations; sling capacities; and load distribution for two-crane lifts.

### Flux Core for Ironworking (40 Hours)

Describes the equipment and methods used in flux core arc welding (FCAW). Includes proper selection and use of filler metals and shielding gases, as well as techniques for performing fillet and V-groove welding in various positions.

### Stud Welding (10 Hours)

Introduces the stud welding process, stud welding safety, and identifies the equipment used to weld studs. Provides step-by-step procedures to set up welding equipment and guidelines to make acceptable stud welds with proper stud placement. Explains testing of stud welds.

### Structural Ironworking Three (10 Hours)

Explains the techniques used to plumb, align and guy steel structures, including the associated hazards and risks. Provides information and procedures related to the installation of trusses and curtain walls.

### Advanced Rigging (10 Hours)

Explains how the load weight and center of gravity affect a lift. Covers sling selection and spreader bar use, as well as the use of cribbing and inclined planes. Includes case studies from three complex lifts.

### Precast/Tilt-up Erection (12.5 Hours)

Describes the fabrication and uses of precast concrete elements and cast-in-place tilt-up wall systems. Focuses on rigging practices associated with these two distinct construction methods and the role of ironworkers in their installation.

### Special Application Hoisting devices (10 Hours)

Explains techniques for rigging and moving equipment using a variety of hoisting devices, including gin poles, Chicago booms, A-frames, davits, balance beams, pump handles, high lines, caterpillar dollies, rollers. Also covers special cranes, including derricks, gantries, HLDs, trolley cranes, and jacking frames.

### Survey Equipment use and Care Two (15 Hours)

Focuses on the total station and its uses, including setup and controls. It includes information on primary and secondary control points and procedures for turning horizontal angles and plumbing columns and wall panels.

### Pre-Engineered Systems (5 Hours)

Identifies the structural components and accessories of metal buildings and describes their installation. Describes the preerection and erection procedures that apply to their installation and the safety precautions associated with the installation.

### Miscellaneous/Ornamental Ironworking (5 Hours)

Identifies the types of ornamental metal and describes the different types of components used in ornamental ironworking. Explains the skills required to fabricate and install ornamental components safely.

### Grating and Checkered Plate (5 Hours)

Provides general information and procedures for the installation and attachment of gratings and checker plate. Describes the rigging methods associated with grating and checker plate.

### Air Carbon Arc Cutting and Gouging (12.5 Hours)

Describes air carbon arc cutting equipment and processes. Identifies the electrodes and safe operation of the equipment. Provides step-by-step instructions for performing air carbon arc washing and gouging activities.

### Demolition (10 Hours)

Identifies the tools used to remove rivets and explains the demolition skills required to safely remove structural steel beams, steel columns, and steel reinforced concrete columns.







# Masonry

## PROGRAM HOURS

Total = 504 hours

Core = 72 hours

Lab 42 hours | Lecture 30 hours

Level 1 = 144 hours

Lab 47 hours | Lecture 25 hours

Level 2 = 144 hours

Lab 94 hours | Lecture 50 hours

Level 3 = 144 hours

Lab 94 hours | Lecture 50 hours

## Masonry

Masonry is a construction method that uses individual units, like brick and stone, bound together with mortar. It is one of the most durable construction techniques in the world, and it has been popular for centuries. Although it is remarkably durable, masonry does still wear down over time and is often in need of repair or restoration.

### LEVEL ONE: 1 semester = 72 class hours

Tuition: \$1,500 per semester

Program Length: Certification (8 semesters/4 years)

Instructor - Student ratio 1:20

## MODULES

### Introduction to Masonry (12.5 Hours)

Covers basic masonry materials, tools, techniques, and safety precautions. Explains how to mix mortar by hand and lay masonry units. Also describes the skills, attitudes, and abilities of successful masons.

### Masonry Safety (15 Hours)

Describes how to identify the common causes of accidents and the hazards associated with masonry tools, equipment, mortar, and concrete. Focuses on using personal protective equipment, working safely from elevated surfaces, properly using masonry tools and equipment, and handling masonry materials safely.

### Masonry Tools & Equipment (15 Hours)

Describes a variety of hand tools, measuring tools, mortar equipment, power tools and equipment, and lifting equipment that masons use on the job, and explains how to use these tools correctly and safely. Provides instructions for assembling and disassembling scaffolds.

### Measurements, Drawings, and Specifications (10 Hours)

Reviews the calculation of distances and areas common in masonry work; describes the information found on residential construction drawings; and explains the role of specifications, standards, and codes.

### Mortar (10 Hours)

Explains the types and properties of mortar and the materials used in the mixture, including admixtures; provides instructions for mixing mortar by machine; and describes how to properly apply and store mortar.

### Masonry Units and Installation Techniques (60 Hours)

Covers characteristics of block and brick; how to set up, lay out, and bond block and brick; how to cut block and brick; how to lay and tool block and brick; and how to clean block and brick once they have been laid. Describes masonry reinforcements and accessories used to lay block and brick professionally and safely.

### LEVEL TWO: 2 semesters = 144 class hours

Tuition: \$1,500 per semester

## MODULES

### Residential Plans and Drawing Interpretation (12.5 Hours)

Explains how to work with residential plans and construction drawings and convert that information into action on the job. Describes the organization and format of plans, dimensioning and scaling, and estimating materials quantities from information on the plans. proper spacing of hangers, load ratings, and installation of hangers and support systems.

### Residential Masonry (25 Hours)

Covers the construction techniques for residential and small structure foundations, steps, patios, decks, chimneys, and fireplaces. Describes work activities that the mason must perform, as well as those that tie into the masonry work.

### Reinforced Masonry (20 Hours)

Focuses on the use of grout and other types of reinforcement, such as reinforcing steel, to strengthen and support masonry structures. Describes the locations where grout can be used and the techniques for placement. Discusses the use and application of various types of reinforced masonry elements, such as rebar and bond beam lintels.

### Masonry Openings and Metalwork (20 Hours)

Introduces types of metal components, including metal rods, joint reinforcements, plates, anchors, fasteners, and hollow metal frames for doors and windows, and explains how they are installed.

### Advanced Laying Techniques (40 Hours)

Describes the construction of masonry wall systems, weep vents, and joints. Includes safety requirements and interaction with structural components.

### Effects of Climate on Masonry (20 Hours)

Describes materials and techniques used to apply insulation and methods of moisture control as they relate to the mason's trade. Includes hot- and cold-weather considerations.

### Construction Inspection and Quality Control (15 Hours)

Introduces the quality control requirements for masonry construction. Presents procedures for inspection and testing of masonry materials and finished masonry construction.



**LEVEL THREE: 2 semesters = 144 class hours**

Tuition: \$1,500 per semester

## **MODULES**

### **Elevated Masonry (15 Hours)**

Describes how to work safely and efficiently on elevated structures. Explains how to maintain a safe work environment, ensure protection from falls, how to brace walls from outside forces, and how to identify common types of elevated walls. Stresses safety around equipment such as cranes and hoists.

### **Specialized Materials and Techniques (60 Hours)**

Introduces unique types of masonry situations that won't be encountered on every job, including soundbarrier walls, arches, and the use of acid brick, refractory brick, and glass block. Describes the handling and construction of these materials, and introduces the intricacies of each.

### **Repair and Restoration (20 Hours)**

Details techniques for identifying and repairing common masonry problems of weathering, settling, stain, etc. Explains tuckpointing, the removal of efflorescence and stains, and crack repair. Includes sections on how to repair foundation walls, water intrusion, and localized problems, as well as fireplace and chimney repair.

### **Commercial Drawings (25 Hours)**

Explains how to read and identify drawings for commercial structures using previous experience from structural drawings as a baseline. Describes requirements for these drawings, as well as how to interpret and create plans for architectural, structural, and shop drawings.

### **Estimating (25 Hours)**

Describes how to estimate building materials, such as brick, block, grout, mortar, joint reinforcement, and masonry ties. Details multiple methods for estimating, as well as how to estimate for masonry elements such as openings and lintels.

### **Site Layout – Distance Measurement and Leveling (20 Hours)**

Covers the techniques needed to produce and read site plans and topographic maps. Describes the use of measuring devices such as tapes, range poles, plumb bobs, total stations, leveling instruments, and field notes. Also discusses the construction of batter boards and how to ensure correct measurements.

### **Stone Masonry (15 Hours)**

Focuses on the application of natural stone in masonry construction. Describes types of stone and how stone is cut, finished, and stored. Discusses equipment and tools for handling stone. Details how to estimate and install stone using anchors and mortars and explains how to install stone veneers.

### **Fundamentals of Crew Leadership (20 Hours)**

Covers basic leadership skills and explains different leadership styles, communication, delegating, and problem solving. Jobsite safety and the crew leader's role in safety are discussed, as well as project planning, scheduling, and estimating. Includes performance tasks to assist the learning process.





# MILLWRIGHT

## PROGRAM HOURS

Total = 720 hours

Core = 72 hours

Lab 42 hours | Lecture 30 hours

Level 1 = 72 hours

Lab 47 hours | Lecture 25 hours

Level 2 = 144 hours

Lab 94 hours | Lecture 50 hours

Level 3 = 144 hours

Lab 94 hours | Lecture 50 hours

Level 4 = 144 hours

Lab 94 hours | Lecture 50 hours

Level 5 = 144 hours

Lab 94 hours | Lecture 50 hours

## Millwright

Millwrights install, align, and troubleshoot machinery in factories, power plants (particularly the precision machinery required in nuclear power plants), and other industrial sites. They install conveyor systems, connect machinery to power supplies and piping, direct hoisting and setting of machines, and adjust the moving and stationary parts of machines to certain specifications. Millwrights must be extremely skilled at mathematics and interpreting blueprints and specifications to set machines at perfect measurements, sometimes working with clearances no bigger than thousandths of an inch.

### LEVEL ONE: 1 semester = 72 class hours

Tuition: \$1,500 per semester

Program Length: Certification (10 semesters/5 years)

Instructor - Student ratio 1:20

## MODULES

### Orientation to the Trade (5 Hours)

Presents the history of the trade and discusses career paths for millwrights. Describes environments and types of work associated with the millwright trade.

### Millwright Hand Tools (15 Hours)

Introduces various hand tools used in the millwright trade. Explains basic hand tool safety and covers the methods for selecting, inspecting, using, and maintaining these tools.

### Fasteners and Anchors (10 Hours)

Identifies the various types of fasteners and anchors used by millwrights, including their applications and installation procedures.

### Basic Layout (20 Hours)

Discusses the tools used in layout. Explains how to lay out baselines using the arc method and 3-4-5 method.

### Gaskets and O-Rings (10 Hours)

Describes gaskets and O-rings and their applications. Provides instructions for laying out, cutting, and installing gaskets.

### Oxyfuel Cutting (15 Hours)

Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and provides instructions for setting up, lighting, and using the equipment. Covers straight line cutting, piercing, beveling, washing, and gouging.

### LEVEL TWO: 2 semesters = 144 class hours

Tuition: \$1,500 per semester

## MODULES

### Intermediate Trade Math (20 Hours)

Explains ratios and proportions. Covers basic algebra, area, volume, circumference, and circular speed problems. Describes how to use a scientific calculator.

### Field Sketching (10 Hours)

Teaches the basic skills needed to create the field sketches used to convey information about how parts should be made or assembled.

### Intermediate Blueprint Reading (20 Hours)

Explains orthographic projection, isometric, and schematic drawings used to show piping, hydraulic, and pneumatic systems.

### Specialty Tools (10 Hours)

Explains how to select, inspect, and maintain torque multipliers, cable cutters, nut splitters, keyseat rules, zero-to-one micrometers, and various gauges.

### Millwright Power Tools (20 Hours)

Introduces different types of millwright power tools and provides step-by-step procedures for selection, using, and maintaining these tools.

### Rigging (20 Hours)

Explains how to identify, select, and inspect rigging hardware. Also covers lifting capacity charts, load balancing, and pick points.

### Setting Baseplates and Soleplates (15 Hours)

Explains how to lay out and install baseplates and soleplates. Describes how to field-verify a plate installation.

### Lubrication (20 Hours)

Explains lubrication safety, storage, and classifications. Covers lubricant and additive selection, lubrication equipment, and lubricating charts.

### Introduction to Bearings (15 Hours)

Describes the types and applications of bearings, including plain, roller, ball, thrust and guide bearings, as well as pillow block, flanged, and takeup bearings. Also explains bearing designation systems.

### LEVEL THREE: 2 semesters = 144 class hours

Tuition: \$1,500 per semester

## MODULES

### Advanced Trade Math (20 Hours)

Explains right triangle trigonometry and its use in the trade. Also covers interpolation, equilateral and isosceles triangles, and the laws of acute triangles.





**Precision Measuring Tools (20 Hours)**

Explains how to select, inspect, use and care for levels, calipers, micrometers, height gauges and surface plates, dial indicators, protractors, parallels and gauge blocks, trammels, and pyrometers.

**Installing Packing (10 Hours)**

Explains the types of packing and packing materials found in a typical stuffing box. Covers how to remove packing and how to install compression packing and lip-types packing.

**Installing Seals (5 Hours)**

Covers the applications, removal, and installation procedures for dynamic and static seals, and lip, cup, oil, and labyrinth seals.

**Installing Mechanical Seals (20 Hours)**

Covers function and advantages of mechanical seals, identifies parts and types of seals, and includes procedures for removing, inspecting, and installing mechanical seals.

**Removing and Installing Bearings (20 Hours)**

Explains how to remove, troubleshoot, and install tapered, thrust, spherical roller, pillow block, and angular contact ball bearings.

**Couplings (15 Hours)**

Identifies various types of couplings, and covers installation procedures using the press-fit method and the interference-fit method. Also covers coupling removal procedures.

**Fabrication Shims (5 Hours)**

Describes types of shim stock and materials, and explains the procedures for fabricating shims.

**Alignment Fixtures and Specialty Jigs (10 Hours)**

Explains the applications and fabrication procedures for angle iron, chain, complex reverse-indicator, Christmas tree, and piano wire jigs.

**Prealignment for Equipment Installation (15 Hours)**

Explains how to level equipment using jack bolts, wedges, and shims. Covers precision leveling procedures and performing clearance installation. Also describes basic steps for setting motors and pumps.

**Installing Belt and Chain Drives (10 Hours)**

Covers the sizes, uses, and installation procedures of six types of drive belts and two types of chain drives.

**Installing Fan and Blowers (10 Hours)**

Identifies and explains how to install axial-flow fans, centrifugal fans, and roots-type and screw-type blowers.

**LEVEL FOUR: 2 semesters = 144 class hours**

Tuition: \$1,500 per semester

**MODULES****Conveyors (5 Hours)**

Describes the types of conveyor systems and their principles of operation.

**Troubleshooting and Repairing Conveyors (12.5 Hours)**

Describes maintaining and repairing belt, roller, chain, screw, and pneumatic conveyors.

**Conventional Alignment (30 Hours)**

Explains the procedures involved in aligning shafts, first with straight edge and feeler gauges, then with dial indicators.

**Pumps (20 Hours)**

Describes the common types of pumps and their principles of operation. Explains centrifugal, rotary, reciprocating and metering pumps. Also explains net positive suction head and cavitation.

**Troubleshooting and Repairing Pumps (7.5 Hours)**

Describes inspecting, troubleshooting, assembling and disassembling pumps. Explains installing pumps, and preparing them for start-up. Discusses shutdown, repair, and removal of pumps from system.

**Compressors and Compressor Maintenance (20 Hours)**

Introduces compressors and the troubleshooting and maintenance procedures associated with compressors.

**Basic Pneumatic Systems (7.5 Hours)**

Explains pneumatic system components and compressed-air treatment. Introduces equipment auxiliary and special-application equipment used with compressors and with tools.

**Troubleshooting and Repairing Pneumatic Equipment (10 Hours)**

Explains repair and maintenance of pneumatic system components. Describes troubleshooting process and methods, including pressure sensors and flow sensors.

**Basic Hydraulic Systems (10 Hours)**

Describes principles and types of hydraulic equipment and safety procedures. Describes application of hydraulic equipment.

**Troubleshooting and Repairing Hydraulic Equipment (7.5 Hours)**

Explains inspecting hydraulic systems, diagnosing problems, and repairing systems. Shows how to read hydraulic schematic symbols.

**Troubleshooting and Repairing Gearboxes (20 Hours)**

Describes types and operation of gearboxes, and gearbox diagnostics. Explains how to troubleshoot, remove, and disassemble gearboxes, how to identify gear wear patterns, and how to install and maintain gearboxes.

**LEVEL FIVE: 2 semesters = 144 class hours**

Tuition: \$1,500 per semester

**MODULES****Reverse Alignment (30 Hours)**

Describes preparation for dial indicator reverse alignment, and explains the procedures for setting up reverse alignment jigs. Explains graphic and mathematical techniques for aligning equipment, based on reverse dial indicator measurements.

**Laser Alignment (25 Hours)**

Using one example system, describes the principles of using laser alignment systems to perform alignments.

**Advanced Blueprint Reading (25 Hours)**

Describes the use of drawing sets to obtain information about a system; explains the process of identifying a part of a machine for repair or replacement from a set of drawings.

**Optical Alignment (25 Hours)**

Explains how to use theodolites, optical levels, auto levels, and total stations to place and align equipment.

**Turbines (20 Hours)**

Describes the process of inspecting and repairing key components of turbines. Explains applications of particular types, including gas, steams, and water turbines.

**Maintaining and Repairing Turbine Equipment (15 Hours)**

Describes the process of inspecting and repairing key components of turbines. Explains the guidelines for maintaining large steam turbines.

**Installing Electric Motors (10 Hours)**

Describes the types of electric motors. Explains the installation of motors.

**Preventive and Predictive Maintenance (10 Hours)**

Explains preventive and predictive maintenance programs. Provides information on nondestructive testing, and introduces the basic techniques for NDE. Lubricant analysis, and acoustic, infrared, and vibration testing are also discussed.

**Vibration Analysis (5 Hours)**

Explains the causes of vibration and the procedures and types of equipment used in vibration analysis. Describes the kinds of equipment used for vibration testing and monitoring. Describes field machine balancing.



**PROGRAM HOURS****Total = 576 hours**

Core = 72 hours

Lab 42 hours | Lecture 30 hours

Level 1 = 72 hours

Lab 47 hours | Lecture 25 hours

Level 2 = 144 hours

Lab 94 hours | Lecture 50 hours

Level 3 = 144 hours

Lab 94 hours | Lecture 50 hours

Level 4 = 144 hours

Lab 94 hours | Lecture 50 hours

**Pipefitter**

Pipefitters plan and install detailed pipe systems for commercial and industrial projects. These pipes may carry water, chemicals, or gases to the crucial building systems. Pipefitters use many tools to cut and bend pipes to exact specifications.

**LEVEL ONE: 1 semester = 72 class hours**

Tuition: \$1,500 per semester

Program Length: Certification (8 semesters/4 years)

Instructor - Student ratio 1:20

## MODULES

**Orientation to the Trade (5 Hours)**

Provides a comprehensive overview of work performed by the pipefitter, as well as pipefitter responsibilities, career opportunities, and safety principles associated with the pipefitting trade.

**Pipefitting Hand Tools (20 Hours)**

Covers general hand tool safety as well as procedures for selecting, inspecting, using, and maintaining hand tools used by pipefitters. Coverage includes pipe wrenches, pipe stands, pipe vises, levels, pipe fabrication tools, pipe bending tools, and pipe joining tools.

**Pipefitting Power Tools (15 Hours)**

Covers general power tool safety as well as procedures for selecting, inspecting, using, and maintaining power tools used by pipefitters. Provides guidelines for using electrical and pneumatic tools, including pipe threading machines.

**Oxyfuel Cutting (17.5 Hours)**

Explains the safety requirements for oxyfuel cutting. Identifies oxyfuel cutting equipment and provides instructions for setting up, lighting, and using the equipment. Includes straight line cutting, piercing, beveling, washing, and gouging.

**Ladders and Scaffolds (12.5 Hours)**

Describes hazards and safety procedures governing the use of stepladders, extension ladders, fixed scaffolds, and rolling scaffolds. Includes general procedures for scaffold assembly and use.

**Motorized Equipment (10 Hours)**

Explains the safety factors, operator maintenance, and operating procedures associated with motorized equipment used on job sites, including electrical generators, air compressors, aerial lifts, pumps, forklifts, and hydraulic cranes.

**LEVEL TWO: 2 semesters = 144 class hours**

Tuition: \$1,500 per semester

## MODULES

**Piping Systems (5 Hours)**

Introduces chemical, compressed air, fuel oil, steam, and water systems. Explains how to identify piping systems according to color codes.

**Drawings and Detail Sheets (15 Hours)**

Introduces the trainee to plot plans, structural drawings, elevation drawings, as-built drawings, equipment arrangement drawings, P&IDs, isometric drawings, spool sheets, and detail sheets.

**Identifying and installing Valves (20 Hours)**

Identifies and provides installation methods for different types of valves. Also covers valve storage and handling.

**Pipefitting Trade Math (15 Hours)**

Explains how to use ratios and proportions, solve basic algebra problems, solve area, volume, and circumference problems, and solve for right triangles, using the Pythagorean Theorem.

**Threaded Pipe Fabrication (15 Hours)**

Describes the materials used in threaded piping systems. Explains how to determine pipe lengths between threaded pipe fittings, prepare the pipe and fittings for fit-up, and assemble the piping system.

**Socket Weld Pipe Fabrication (25 Hours)**

Describes the materials used in socket weld piping systems. Explains how to determine pipe lengths between socket weld fittings, prepare the pipe and fittings for fit-up, and fabricate socket weld fittings.

**Butt Weld Pipe Fabrication (37.5 Hours)**

Describes the materials used in butt weld piping systems. Explains how to determine pipe lengths between butt weld fittings, prepare the pipe and fittings for fit-up, and fabricate butt weld fittings. Also describes how to select and install backing rings, fabricate channel iron welding jigs, and use and care for welding clamps.

**Rigging Excavations (10 Hours)**

Explains the use of shoring materials per OSHA standards and covers shoring systems, installing a hydraulic vertical shore, determining the overall fall of sewer line, setting grade and elevation of trench, and backfilling.

**Underground Pipe Installation (20 Hours)**

Explains installation procedures and guidelines including the procedures for cast-iron pipe, ductile iron pipe, concrete, carbon steel, fiberglass and thermoplastic pipe. Includes an introduction to horizontal directional drilling for pipe installation.

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**LEVEL THREE: 2 semesters = 144 class hours**  
Tuition: \$1,500 per semester

## MODULES

### **Rigging Equipment (10 Hours)**

Describes the use and inspection of basic equipment and hardware used in rigging, including slings, wire rope, chains, and attaching hardware. Explains sling angles. Describes the use of tuggers, jacks, hoists, and come-alongs.

### **Rigging Practices (10 Hours)**

Describes basic rigging and crane hazards and related safety procedures. Provides an overview of personnel lifting and lift planning. Introduces crane load charts and load balancing. Includes instructions for rigging and lifting pipe.

### **Standards and Specifications (10 Hours)**

Explains how to read and interpret pipefitting standards, codes, and specifications. Describes how to identify pipe and components according to specifications.

### **Advanced Trade Math (25 Hours)**

Discusses the use of equivalent and conversion tables. Explains how to use right angle trigonometry to calculate take-outs.

### **Motorized Equipment II (10 Hours)**

Covers the applications and safety requirements of drain cleaners, manlifts, and cable lifts.

### **Introduction to Aboveground Pipe Installation (20 Hours)**

Identifies various types of pipe, flanges, gaskets, and bolts. Includes step-by-step procedures for installing pipe sleeves and floor penetrations.

### **Field Routing and Vessel Trim (15 Hours)**

Explains how to secure the work area and determine field run specifications, load weights for erection equipment, and support needs. Covers how to erect vessel trim.

### **Pipe Hangers and Supports (25 Hours)**

Explains how to identify, select, and install pipe hangers and supports, including spring can supports.

### **Testing Piping Systems and Equipment (20 Hours)**

Explains how to perform pretest, service flow tests, head pressure tests, hydrostatic tests, and steam blow tests.

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**LEVEL FOUR: 2 semesters = 144 class hours**  
Tuition: \$1,500 per semester

## MODULES

### **Advanced Blueprint Reading (50 Hours)**

Introduces drawings used by pipefitters in the shop and in the field. Explains how to read and interpret P&IDs, general arrangement drawings, ISOs, and spool sheets. Included are step-by-step instructions for following a line of pipe through a set of drawings. Includes nine 11" x 17" drawings.

### **Advanced Pipe Fabrication (50 Hours)**

Discusses how to lay out and fabricate mitered bends, laterals, wyes, and ninety-degree intersections using tables of ordinates or a calculator. This knowledge is required in order to fabricate specialty bends and intersections.

### **Stress Relieving and Aligning (10 Hours)**

Explains the nature of misalignment and methods of correcting it. Includes terminology that will help pipefitters communicate with millwrights who perform pump setup.

### **Steam Traps (10 Hours)**

Describes the types of steam traps, their functions and advantages, and the basic methods of troubleshooting steam traps.

### **In-Line Specialties (10 Hours)**

Describes specialty devices used in pipelines, including: bleed rings; ball and expansion joints; measuring devices for temperature, level, flow rate, and pressure; steam traps; drip legs; and desuperheaters. The purpose and function of each type is explained.

### **Special Piping (25 Hours)**

Discusses methods of assembling copper and plastic pipe and tubing. Introduces brazing and soldering, and explains the difference between these two procedures. Also describes compression and flared fitting, and grooved and compression formed joining methods.

### **Hot Taps (10 Hours)**

Explains the mechanics of attaching fittings to the pipeline while the line is under pressure. Covers line stopping, freeze stopping, and adding connections to the line.

### **Maintaining Valves (10 Hours)**

Explains how to replace packing and O-rings, and how to open and close a valve's bonnet. Discusses how to safely troubleshoot and maintain several tubes of valves.

### **Introduction to Supervisory Roles (7.5 Hours)**

Offers basic information for pipefitters who have a desire to move into supervisory roles. Provides information on issues related to cultural differences, gender-based social behaviors, and legal and ethical situations that a supervisor is likely to encounter.







# PLUMBING

## Plumbers

Plumbers do much more than fix sinks and toilets in residential homes. They design and install piping systems that distribute water and remove waste from buildings, connecting to washers, sinks, heating, and cooling systems. Plumbers have to be knowledgeable in the water distribution, blueprint reading, local ordinances and regulations, mathematics, mechanical drawing, physics, welding, and soldering.

### PROGRAM HOURS

Total = 576 hours

Core = 72 hours

Lab 42 hours | Lecture 30 hours

Level 1 = 72 hours

Lab 47 hours | Lecture 25 hours

Level 2 = 144 hours

Lab 94 hours | Lecture 50 hours

Level 3 = 144 hours

Lab 94 hours | Lecture 50 hours

Level 4 = 144 hours

Lab 94 hours | Lecture 50 hours

### LEVEL ONE: 1 semester = 72 class hours

Tuition: \$1,500 per semester

Program Length: Certification (8 semesters/4 years)

Instructor - Student ratio 1:12

## MODULES

### Introduction to the Plumbing Profession (5 Hours)

Introduces trainees to career options in the plumbing profession. Provides a history of plumbing and also discusses the current technology, industries, and associations of the plumbing profession. Reviews human relations and safety skills.

### Plumbing Safety (22.5 Hours)

Discusses the causes of accidents and their consequences including delays, increased expenses, injury, and loss of life. Reviews the types and proper use of personal protective equipment (PPE). Explains the use of critical safety information including HazCom, safety signs, signals, lockout/tagout, and emergency response. Covers confined-space safety, and reviews safety issues related to hand and power tools.

### Tools of the Plumbing Trade (10 Hours)

Describes the care and use of hand and power tools trainees will use on the job. Explains how to select the appropriate tools for different tasks, and reviews tool maintenance and safety issues.

### Introduction to Plumbing Math (12.5 Hours)

Reviews basic math concepts, such as whole numbers, fractions, decimals, and squares, and demonstrates how they apply to on-the-job situations. Explains how to measure pipe using fitting tables and framing squares and how to calculate 45-degree offsets.

### Introduction to Plumbing Drawings (17.5 Hours)

Introduces different types of plumbing drawings and discusses how to interpret and apply them when laying out and installing plumbing systems. Explains the symbols used in plumbing and mechanical drawings, and reviews isometric, oblique, orthographic, and schematic drawings. Requires trainees to render plumbing drawings and to recognize how code requirements apply to plumbing drawings.

### Plastic Pipe and Fittings (12.5 Hours)

Introduces different types of plastic pipe and fittings used in plumbing applications, including ABS, PVC, CPVC, PE, PEX, and PB. Describes how to measure, cut, join, and support plastic pipe according to the manufacturer's instructions and applicable codes. Discusses pressure testing of plastic pipe once installed.

### Copper Pipe and Fittings (12.5 Hours)

Discusses sizing, labeling, and applications of copper pipe and fittings, and reviews the types of valves that can be used on copper pipe systems. Explains proper methods for cutting, joining, and installing copper pipe. Addresses insulation, pressure testing, seismic codes, and handling and storage requirements.

### Cast-Iron Pipe and Fittings (12.5 Hours)

Introduces hub-and-spigot and no-hub cast-iron pipe and fittings and their applications in DWV systems. Reviews material properties, storage and handling requirements, and fittings and valves. Covers joining methods, installation, and testing.

### Carbon Steel Pipe and Fittings (12.5 Hours)

Discusses threading, labeling, and sizing of steel pipe and reviews the differences between domestic and imported pipe. Covers the proper techniques for measuring, cutting, threading, joining, and hanging steel pipe. Also reviews corrugated stainless steel tubing.

### Introduction to Plumbing Fixtures (7.5 Hours)

Discusses the proper applications of code-approved fixtures in plumbing installations. Reviews the different types of fixtures and the materials used in them. Covers storage, handling, and code requirements.

### Introduction to Drain, Waste, and Vent Systems (10 Hours)

Explains how DWV systems remove waste safely and effectively. Discusses how system components, such as pipe, drains, traps, and vents work. Reviews drain and vent sizing, grade, and waste treatment. Discusses how building sewers and sewer drains connect the DWV system to the public sewer system.

### Introduction to Water Distribution Systems (10 Hours)

Identifies the major components of water distribution systems and describes their functions. Reviews water sources and treatment methods, and covers supply and distribution for the different types of systems that trainees will install on the job.

### LEVEL TWO: 2 semesters = 144 class hours

Tuition: \$1,500 per semester

## MODULES

### Plumbing Math Two (15 Hours)

Explains the Pythagorean theorem and reviews methods for finding angles. Discusses the techniques used to calculate simple and rolling offsets, as well as, offsets on parallel runs of pipe.

### Reading Commercial Drawings (25 Hours)

Provides instruction in the identification and interpretation of civil, architectural, structural, HVAC/mechanical, plumbing, and electrical drawings, as well as how to use them to ensure accurate dimensions, generate RFIs, locate plumbing entry points, and establish piping routes and fixture locations.

### Structural Penetrations, Insulation, and Fire Stopping (15 Hours)

Introduces methods for adjusting structural members, insulating pipe, and installing fire-stopping. Covers reinforcement techniques for modified structural members; how to measure, cut, and install fiberglass and flexible foam insulation; and how to identify walls, floors, and ceilings that require fire-stopping.



**Installing and Testing DWV Piping (30 Hours)**

Explains how to locate, install, connect, and test a complete drain, waste, and vent (DWV) system. Discusses how to develop material takeoffs, set up and use levels, locate building sewers and building drains, locate fixtures, and test a DWV system.

**Installing Roof, Floor, and Area Drains (5 Hours)**

Covers the proper techniques for locating, installing, and connecting roof, floor, and area drains and floor sinks according to code. Discusses waterproof membranes and flashing, drain components, shower pans, trap primers, and proper drain applications.

**Installing and Testing Water Supply Piping (20 Hours)**

Explores the proper techniques for locating, installing, and testing complete water service and distribution systems, including meters, water heaters, water softeners, and hose bibbs. Introduces basic backflow and water hammer prevention, and discusses the installation of shower and tub valves, ice maker and washing machine boxes, and pipe stubouts and supports.

**Types of Valves (5 Hours)**

Reviews types of valves, their components, and applications. Also covers valve servicing.

**Installing Fixtures and Valves (20 Hours)**

Covers the installation of basic plumbing fixtures, including bathtubs, shower stalls, lavatories, sinks, water closets, and urinals. Reviews the installation of associated valves, faucets, and components. Explains how to connect appliances such as dishwashers, food-waste disposers, refrigerators and ice makers, and washing machines.

**Installing Water Heaters (10 Hours)**

Discusses gas-fired, electric, tankless, heat pump, and indirect water heaters, components, and applications. Reviews proper installation and testing techniques and covers the latest code requirements for water heaters.

**Basic Electricity (10 Hours)**

Introduces electrical safety and the principles of electricity including voltage, current, resistance, and power. Includes important electrical formulas, circuitry, and common plumbing-related electrical applications.

**Fuel Gas and Fuel Oil Systems (20 Hours)**

Introduces techniques for safe handling of natural gas, liquefied petroleum gas, and fuel oil. Reviews fuel gas and fuel oil safety precautions and potential hazards, applications, systems installation, and testing.

**LEVEL THREE: 2 semesters = 144 class hours**

Tuition: \$1,500 per semester

**MODULES****Applied Math (17.5 Hours)**

Reviews math concepts, including weights and measures, area and volume, temperature, pressure, and force. Describes the six simple machines: inclined planes, levers, pulleys, wedges, screws, and wheels and axles.

**Sizing Water Supply Piping (30 Hours)**

Teaches techniques for sizing water supply systems, including calculating system requirements and demand, developed lengths, and pressure drops. Reviews the factors that can reduce efficiency of water supply piping. Introduces different backflow prevention devices and explains how they work, where they are used, and how they are installed in water supply systems.

**Potable Water Supply Treatment (15 Hours)**

Explains how to disinfect, filter, and soften water supply systems. Discusses how to troubleshoot water supply problems, flush out visible contaminants from a plumbing system, and disinfect a potable water plumbing system.

**Types of Venting (20 Hours)**

Reviews the different types of vents that can be installed in a DWV system and how they work. Also teaches design and installation techniques.

**Sizing DWV and Storm Systems (20 Hours)**

Explains how to calculate drainage fixture units for water systems. Reviews how to size drain, waste, and vent (DWV) systems; storm drainage systems; and roof storage and drainage systems.

**Sewage Pumps and Sump Pumps (12.5 Hours)**

Discusses the installation, diagnosis, and repair of pumps, controls, and sumps in sewage and storm water removal systems.

**Corrosive-Resistant Waste Piping (7.5 Hours)**

Discusses corrosive wastes and reviews related safety issues and hazard communications. Discusses how to determine when corrosive-resistant waste piping needs to be installed, as well as, how to correctly select and properly connect different types of piping.

**Compressed Air (10 Hours)**

Explains the principles of compressed air systems and describes their components and accessories. Reviews installation and periodic servicing of air compressor systems.

**Service Plumbing (27.5 Hours)**

Covers the troubleshooting and repair of fixtures, valves, and faucets in accordance with code and safety guidelines. Explains how to diagnose and repair water supply and drainage piping, water heaters, and other appliances and fixtures. Describes the effects of corrosion, freezing, and hard water on plumbing systems.

**LEVEL FOUR: 2 semesters = 144 class hours**

Tuition: \$1,500 per semester

**MODULES****Business Principles for Plumbers (15 Hours)**

Introduces trainees to concepts and practices that are essential for competitive, successful plumbing businesses. Covers basic business accounting and project estimating, as well as techniques for cost control and task organization.

**Fundamentals of Crew Leader (20 Hours)**

While this module has been designed to assist the recently promoted crew leader,

it is beneficial for anyone in management. The course covers basic leadership skills and explains different leadership styles, communication, delegating, and problem solving. Jobsite safety and the crew leader's role in safety are discussed, as well as project planning, scheduling, and estimating. Includes performance tasks to assist the learning process..

**Water Pressure Booster and Recirculation Systems (12.5 Hours)**

Builds on trainees; previous experience with pumps, storage tanks, controls, and pipes and fittings by teaching them to assemble those components into systems that boost water pressure and provide hot water.

**Indirect and Special Waste (17.5 Hours)**

Explains the code requirements and installation procedures for systems that protect against contamination from indirect and special wastes.

**Hydronic and Solar Heating Systems (17.5 Hours)**

Introduces the basic types of hydronic and solar heating systems and their components. Reviews hydronic and solar heating system layout and installation. Also discusses methods inhibiting corrosion in solar heating systems.

**Codes (12.5 Hours)**

Discusses the different types of codes used by plumbers across the country and explains how those codes are written, adopted, modified, and implemented.

**Private Water Supply Well Systems (10 Hours)**

Describes the operation of pumps and well components. Reviews the qualities of good wells and how to assemble and disassemble pumps and components.

**Private Waste-Disposal Systems (10 Hours)**

Describes the types of private waste-disposal systems, discusses the maintenance and installation of these systems, and explains how to determine the local code requirements for these systems. Covers percolation tests and sewage system planning and layout.

**Swimming Pools and Hot Tubs (7.5 Hours)**

Introduces trainees to plumbing systems in swimming pools, hot tubs, and spas.

**Plumbing for Mobile Homes and Travel Trailer Parks (7.5 Hours)**

Describes the location and layout of plumbing systems for mobile home and travel trailer parks. Reviews how to design and lay out a system, how to connect water and sewer lines to a mobile home, and how to estimate materials and costs for the park.

**Introduction to Medical Gas and Vacuum Systems (15 Hours)**

Introduces the various types of medical gas and vacuum systems used in health care facilities. Covers the system requirements and professional qualifications required by code, describes common types of medical gas and vacuum systems, and introduces the safety requirements for installing, testing, and servicing these systems.





# SHEET METAL

## PROGRAM HOURS

Total = 576 hours

Core = 72 hours

Lab 42 hours | Lecture 30 hours

Level 1 = 72 hours

Lab 47 hours | Lecture 25 hours

Level 2 = 144 hours

Lab 94 hours | Lecture 50 hours

Level 3 = 144 hours

Lab 94 hours | Lecture 50 hours

Level 4 = 144 hours

Lab 94 hours | Lecture 50 hours

## Sheet Metal

Sheet Metal Workers cut and mold sheets of metal into products for installing and repairing ventilation and air ducts. They also construct aluminum siding, metal roofing, and gutters. Most sheet metal fabrication shops are completely computerized, so sheet metal workers may be responsible for programming control systems on various pieces of equipment.

### LEVEL ONE: 1 semester = 72 class hours

Tuition: \$1,500 per semester

Program Length: Certification (8 semesters/4 years)

Instructor - Student ratio 1:12

## MODULES

### Introduction to the Sheet Metal Trade (5 hours)

Summarizes the history and development of the sheet metal trade, explains the benefits of apprenticeship, and identifies career opportunities in the trade.

### Tools of the Trade (5 Hours)

Describes the hand and power tools used in the sheet metal trade, including layout tools and cutting, bending, and forming machines. Includes safety and maintenance guidelines.

### Introduction to Sheet Metal Layout and Processes (7.5 Hours)

Introduces parallel line development, radial line development, and triangulation. Covers selection and use of layout, hand, and machine tools. Discusses how to transfer patterns, and how to cut, form, and assemble parts.

### Trade Math One (20 Hours)

Builds on trainees' basic math skills to solve trade-related problems. Covers calculations using denominate numbers, area and volume calculations, English-metric system conversions, basic geometry, and calculation of stretchouts.

### Fabrication One — Parallel Line Development (22.5 Hours)

Covers the steps involved in using the parallel line development method to lay out fittings and includes step-by-step procedures for selected fittings.

### Installation of Ductwork (15 Hours)

Addresses ductwork assembly, use of different types of sealants, using lifts, and installation of ductwork. Describes the types of fasteners (screws, nuts, bolts, and rivets), and supports used in an air distribution system. Discusses proper spacing of hangers, load ratings, and installation of hangers and support systems.

### Installation of Air Distribution Accessories (5 Hours)

Describes how air distribution accessories, such as louvers, dampers, and access doors, function as part of an air distribution system. Includes installation guidelines and checklists.

### Insulation (7.5 Hours)

Describes how to install fiberglass blanket insulation, foam insulation, using approved adhesives and fastening techniques. Also includes the fabrication and installation of fitting covers and preformed fitting covers.

### Architectural Sheet Metal (15 Hours)

Provides instruction in how to lay out and fabricate sheet metal components of a roof drainage system. Includes flashing, gutters, and downspouts.

### LEVEL TWO: 2 semesters = 144 class hours

Tuition: \$1,500 per semester

## MODULES

### Trade Math Two (20 Hours)

Demonstrates how to apply formulas to solve a variety of mathematical problems. Covers linear, area, volume, and angle measurement and percentages, ratios, and proportions. Provides practical instruction in using protractors, vernier calipers, and micrometers and in solving field measuring problems.

### Plans and Specifications (20 Hours)

Reviews how to read and interpret section, elevation, and detail drawings. Also covers other specifications and other sources of project information. Includes 17 construction drawings.

### Fabrication Two — Radial Line Development (55 Hours)

Introduces trainees to radial line development that are used to determine layouts for sheet metal fittings. Includes practice layout and fabrication tasks that allow trainees to develop and demonstrate their skills.

### Sheet Metal Duct Fabrication Standards (7.5 Hours)

Explains how to determine the various requirements for a duct system, including operating pressures, metal gauges, connectors, reinforcements, tie rods, and seams. Also reviews how to use standards, codes and ordinances to design a duct system.

### Air Properties and Distribution (15 Hours)

Explains the properties of air and how these properties relate to one another. Teaches how to use the gas laws, psychrometric charts, and measuring instruments to evaluate air properties in an air distribution system.





**Bend Allowances (5 Hours)**

Provides instruction and practice in determining proper bend allowances in sheet metal. Also reviews the interplay of different factors that affect the amount of bend allowance needed and the methods for calculating allowance.

**Soldering (15 Hours)**

Identifies soldering tools, materials, and techniques. Also provides trainees with a wide range of soldering tasks for practice.

**Basic Piping Practices (7.5 Hours)**

Reviews the methods for measuring, cutting, and joining selected types of pipe using fittings, hangers, and supports. Also reviews pipe materials and applications.

**Fiberglass Duct (20 Hours)**

Reviews fiberglass duct as well as layout and fabrication methods. Also discusses closure, hanging, and support methods and how to repair major and minor damage to fiberglass duct.

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**LEVEL THREE: 2 semesters = 144 class hours**

Tuition: \$1,500 per semester

## MODULES

**Math Three—Field Measuring and Fitting (15 Hours)**

Describes the techniques used for field measuring and layout of ductruns and fittings. Also provides practice in solving field measuring problems.

**Air Systems (10 Hours)**

Reviews the operating principles, components, and applications of common air systems. Discusses constant volume systems, variable volume systems, variable temperature (VVT) systems, variable air volume (VAV) systems, and dual-duct VAV systems.

**Principles of Airflow (22.5 Hours)**

Explains the basic principles of airflow and reviews how airflow is affected by duct size, shape, and fittings. Also reviews the components of an air distribution system.

**Louvers, Dampers, and Access Doors (20 Hours)**

Discusses the different types of louvers, dampers, and access doors used in air distribution systems and reviews the standards that apply to them.

**Comprehensive Plan and Specification Reading (30 Hours)**

Provides a case-study approach to learning how to use building plans and specifications to lay out, fabricate, and install HVAC systems. Allows trainees to proceed through the module as if they were working on an actual building project. Includes construction drawings.

**Fabrication Three: Triangulation (47.5 Hours)**

Describes the principles of triangulation and how it can be used to measure ductrun fittings. Provides trainees with a variety of tasks to practice developing, laying out, and fabricating selected duct run fittings.

**Advanced Architectural Sheet Metal (12.5 Hours)**

Provides the opportunity to practice lay out and fabrication, and installation of various architectural pieces. Makes use of items built in Fabrication Three—Radial Line Development.

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**LEVEL FOUR: 2 semesters = 144 class hours**

Tuition: \$1,500 per semester

## MODULES

**Shop Production and Organization (15 Hours)**

Introduces trainees to the important production, organization, planning, and control functions that occur in a sheet metal shop. Includes discussions of project planning techniques, principles of efficient shop layout and materials flow, and the roles and relationships of shop personnel.

**Air Testing and Balance (25 Hours)**

Describes how to balance air distribution systems so that the right amount of air is correctly distributed at the proper velocities and returned to the heating and cooling units. Reviews the tools and techniques used for adjusting fans, volume dampers, registers, and grilles. Provides proper techniques for duct leakage testing.

**Introduction to Welding, Brazing and Cutting (25 Hours)**

Introduces trainees to the important techniques and proper operation of equipment used for welding, brazing, and cutting. Emphasizes safety and awareness of hazards involved.

**Fume and Exhaust Systems Design (25 Hours)**

Discusses effective and safe workspace ventilation. Introduces the trainees to applicable standards and regulations and reviews the many different types of hoods, filters, and duct designs in fume and exhaust systems.

**Fabrication Four – Comprehensive Review (40 Hours)**

Provides a comprehensive review of parallel line, radial line, and triangulation development methods for laying out sheet metal patterns. Trainees practice laying out and fabricating selected sheet metal fittings using these methods.

**Introductory Skills for the Crew Leader (20 Hours)**

Teaches the basic skills required to supervise personnel. Discusses principles of project planning and management and presents several case studies for student participation.





# WELDING AWS - Level 1

Welders join objects together by applying heat or pressure. Skilled welders have a thorough knowledge of welding principals and metals. They use blueprints and drawings to build anything from ships to cars to bridges. Welders are also crucial in maintaining power plants and the entire piping industry of all types and have the opportunity to travel throughout the year.

## **AWS Level 1: 500 class hours**

(GMAW, GTAW, FCAW, SMAW, Fillet Welds, Open Butt Plate Welds)

Schedule: Tuesday, Wednesday & Thursday

*\*Class runs September - June*

Time: 8:00am - 12:00pm (all days)

Tuition: \$10,500

Program Length: AWS Certification (about 42 weeks)

### **Instructor Bios**

#### **Steven Hilliker**

- 41 years welding experience
- Nuclear Welder
- Chemical Industry Piping and Structural Welder
- CWI / CWE / ASME B31.3 SG-E Member
- Welding Specialist

#### **Kathy Warren**

- 20+ years as a Journeyman Pipefitter/Welder at Dow Corning
- Certified in stick, mig, and tig welding

## **MODULES**

This program provides training and AWS certification in the most common welding processes such as MIG (GMAW), TIG (GTAW), Flux-Core (FCAW), Stick (SMAW), Fillet Welds, and Open Butt Plate Welds. Participants who complete the program are certified as AWS Level-1 Welders. A graduate Level-1 Entry Welder will be able to perform minor external repairs to equipment and accessories in all processes, and setup and perform:

- Stick (SMAW) operations making fillet and groove welds in all positions within a limited thickness range on carbon steel
- MIG (Gas Metal Arc Welding) is short circuit transfer operations, making fillet and groove welds in all positions within a limited thickness range on carbon steel. Gas Metal Arc Welding (spray transfer) operations making fillet and groove welds in limited positions within a limited thickness range on carbon steel.
- Flux-Core (FCAW-SS/GS) operations making fillet and groove welds in all positions within a limited thickness range on carbon steel.
- TIG (GTAW) operations making fillet and groove welds in all positions within a limited thickness range on carbon steel, and in limited positions within a limited thickness range of austenitic stainless steel and aluminum.

### **Effective Immediately -**

As of July 2019, all programs/classes/certifications offered by The Greater Michigan Construction Academy, in association with welding, are accredited by The American Welding Society (AWS).

## Admissions Process

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If you are seeking opportunity to train at the Greater Michigan Construction Academy, contact the GMCA office. New students are required to fill out a student enrollment form and registration and release form prior to enrolling.

Open enrollment dates will occur in June and July for the Fall Semester and November and December for the Winter Semester. Tuition must be paid prior to the first day of class.

Students must be 16 years of age to participate in craft training, unless training is a school-to-career program affiliated with their high school. A high school diploma or GED is not required to enter craft training, however highly encouraged. Exceptions to this only apply if a student is also applying for a scholarship through GMCA. Please refer to requirements under "scholarship program".

Students will not be allowed to register for class after the second week of class.

## Scholarship Program

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Each year, the GMCA offers a limited number of scholarships for students and individuals pursuing post-secondary skilled trade's education and training. Each scholarship covers the cost of tuition and books for the students first year (two 18 week semesters) of a craft training curriculum that's provided by GMCA. For more information or an application, contact the GMCA office.

Scholarship for recent high school graduates: Applications are accepted until March.

## Craft Trade Councils

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In order to insure that GMCA maintains high standards of professional practice and that training stays current with real world development, Greater Michigan Construction Academy has formed various Trade Councils. The Trade Councils are made up of career tradesmen from all construction trades. Their primary responsibility is to enhance text material to incorporate new, innovative trade techniques and make a student's training experience through Greater Michigan Construction Academy a meaningful experience. They also make sure current codes are being taught and texts are supplemented with new legal requirements.

## Craft Championships

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The purpose of Greater Michigan Construction Academy Local Craft Championship competition is to establish the most viable candidates to represent the Greater Michigan Chapter at the ABC National Craft Championships held in conjunction with the annual ABC National Convention. During the Fall Semester of each school year, all Greater Michigan Construction Academy students in the final semesters of their craft training must take a mandatory craft championship competition pretest. The test covers all the modules of their craft curriculum from the first year through the end of the previous year. After the test has been given, each instructor will provide all tests scores to Greater Michigan Construction Academy personnel. There is a minimum score to qualify and that score will determine who will compete at the local competition.

The local competition will consist of a written exam and a hands on performance exam. Judges will combine the performance "hands-on" test score from the projects with the written test score. The craft specific contestant with the greatest overall score will be declared the winner. The winner of the local competition must meet the eligibility requirement to qualify for the ABC National Craft Championship Competition.

Expenses for national competitors are paid for by Greater Michigan Construction Academy Craft Competition Committee.

## Module Completion

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Any student who wishes to retake a module test, who did not achieve the minimum 77% test grade, may request to do so. This may be done in order to successfully complete the course. The first re-take test can be done at no charge. Any re-testing after that incurs a charge of \$25.

A minimum of a 48-hour period is required prior to retesting an individual who did not meet the required score on a written test. Students taking their first re-test may have their score raised up to a 77% (no higher). The second re-test will be conducted at the GMCA office between the hours of 8am – 5pm. The instructor will be required to communicate with the GMCA staff as to what students need to make up a test and to leave a copy of the test with the GMCA staff. If the student does not re-test prior to their next regularly scheduled class the student will receive a failing grade for the Module until the test is made-up. The re-test must be taken within two weeks after the last class of the semester or the student will be dropped from the course. Any student that has to take/retake a test after the semester will be charged a \$25.00 administration fee.

Upon successful completion of all modules in a level of training, students will receive a level completion certificate from NCCER. Students must have successfully completed all levels of training to be eligible for graduation

## Student Attendance

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The integrity of the academy's program is based on the quality instruction and high standards of participation. Greater Michigan Construction Academy expects strict adherence to and enforcement of the attendance policy.

- Every student is required to attend 144 hours of classroom instruction. Each student may miss up to 2 nights of actual class time without consequences. Upon the 3rd absence, the apprentice will have to attend a make-up class (dates determined by GMCA) until they reach the mandatory 144 hours that is required by the DOL.
- An absence is not categorized by unexcused or excused, therefore no documentation of the absence is needed. A student is able to miss up to 2 nights without attending a make-up class, regardless of the reason they have missed.
- Upon a student's 3rd absence, he/she will have to attend a GMCA make-up class and all absences must be made up prior to the students last day of class in order for credit to be granted for that level. An apprentice can miss up to 3 nights for any reason. Upon a student's 4th absence, he/she will be dismissed from class regardless of reasoning. There are no exceptions.
- It is the employer's responsibility to make the apprentice available for class. Having to work or work-related training classes, legal problems, failure of personal transportation, day care issues, etc. are not viable reasons for absences as there are no excused absences.
- It is the student's and the employer's responsibility to check their email for student absences. Absent reports will be emailed within one week of the absence.
- Notification of absence, tardy, or leaving early are sent to the GMCA Education Department by the instructor, weekly. If a student is absent, tardy or has left early, employers will be notified. In the event an absence, tardy or leaving early exceeds the maximum allowed as outlined above and is not made-up, notice of being dropped from the program will be sent to the employer and the instructor.
- Students/apprentices are responsible for coordinating make-up work with the instructor to meet all class objectives. Apprentices must make up the work that was missed. Quizzes, worksheets, labs and exams must be made up and that time does not count as a make-up class.

Tardies - If a student is more than 15 minutes late to class, or chooses to leave more than 15 minutes early, he/she will be marked absent.



## Make-Up Work

All students are responsible for making up all academic and lab work missed in class. Any student who misses a class session must contact their instructor before the next class meeting to arrange for make-up work. Make-up work must be completed within two weeks of the missed class. In the case that a make-up day is required, the student and instructor must agree on a day in which the student and instructor are available to remedy missed assignments if applicable. The Vice President must be informed and scheduling must be made by the instructor and the Vice President.

## Graduation

Upon successful completion of the curriculum, students must pass each module at 70% or higher, students will receive a Certificate of completion stating the trade and year completed. Students are required to have an 80% or better attendance rate to be eligible for graduation. There is also a graduation function planned which is an opportunity for each student to be recognized for their achievement, and a time for employer organizations to recognize the hard work and effort their employees have put into the program.

## Withdrawal

In order to withdraw from a course, the student must complete a Withdrawal Request Form available at the GMCA office. You may also drop a course in person, by e-mail to [cpurdy@gmcaml.org](mailto:cpurdy@gmcaml.org), by calling the GMCA office at (989) 832-8879, by faxing a letter to (989) 695-3025, or by mailing a letter to Greater Michigan Construction Academy, 7730 W. Wackerly St., Midland, MI 48642. Any refund due to you will be processed once the notification

## Incomplete

There may be a time when, due to no fault of the student, the course can not be completed in the allocated time. At the end of the semester, the instructor will record an incomplete ("I") as the official grade. Two conditions are necessary for this to happen, they are

1. 80% of the course work has been completed.
2. The student has a valid reason as to why the balance of the required work was not completed during the time of enrollment.

An "I" grade does not automatically entitle the student to attend classes missed in a new session. It only allows the student additional time to submit work. Any help the student needs to complete the "I" grade is the responsibility of the instructor issuing the "I" grade. Work for an "I" grade is to be determined by the instructor prior to granting the "I" grade.

## Complaints/Grievance Policy

The Executive EDUCATION COMMITTEE will ensure that any grievance issues will be addressed. This committee will consist of the chairman of the Education Committee and 4 additional members of the Education Committee. A trainee may appeal an adverse decision or action directly to this committee. The appeal will be in writing to the committee within thirty (30) days of the aggrieved action (s). The committee shall have the right to ask the trainee to appear in person. The trainee may also appeal to the NATIONAL CENTER FOR CONSTRUCTION EDUCATION AND RESEARCH (NCCER) within sixty (60) days of written notice of an adverse decision handed down by the committee. The decision of the NCCER will be final.

## Appeals Policy

If for any reason the student feels that dismissal from class, or unsatisfactory performance has been granted, the student may appeal with documentation of the mitigating circumstances that have prevented the student from attaining satisfactory academic progress, and evidence that changes have occurred to allow the student to now meet standards of satisfactory academic progress. The Vice President will assess all appeals, and determine whether the student may be permitted to continue in school on a warning status, despite not meeting the satisfactory progress requirements.

## Equal Educational Opportunity

Greater Michigan Construction Academy admits students and makes available to them its advantages, privileges and courses of study without regard to race, color, sex, religion, national origin, sexual orientation or disability.

If there is a student with limited English proficiency, a qualified representative will be found to assist the applicant in completing the necessary forms and assist in interpreting during the entire application and admission process upon the request of the applicant.

Disabled students may voluntarily self-identify for the purpose of requesting reasonable accommodations during the entire application and admission process.

Information on limited English proficiency and disability submitted voluntarily by the applicant, for the purpose of receiving assistance and accommodations during the entire application and admission process, will not affect their admission to the school.

## Student Behavior Expectations

Students are expected to act as responsible adults, allowing for class time dedicated to and conducive to learning. Failure to do so may result in expulsion. The following are examples of unsatisfactory conduct:

- a. Smoking (or use of tobacco in any form) is not permitted on Greater Michigan Construction Academy or Greater Michigan Construction Academy contracted property.
- b. Insubordination (disobedience to authority or failure to follow instructions).
- c. Fighting
- d. Having or consuming alcoholic beverages or drugs on Greater Michigan Construction Academy or The Greater Michigan Construction Academy contracted property.
- e. Causing hazardous or unsafe classroom conditions.
- f. Possession of weapons on Greater Michigan Construction Academy or Greater Michigan Construction Academy contracted property at any time.
- g. Falsification of personnel records or classroom documents.
- h. Horseplay, scuffling, running or throwing material or other objects.
- i. Damage, destruction, or misuse of property and/or equipment belonging to Greater Michigan Construction Academy or Greater Michigan Construction Academy contracted organizations, the instructor, or other students.
- j. Leaving the classroom before the end of the assigned schedule without permission.
- k. Threatening, intimidating, coercing or interfering with the instructor or other students.
- l. Unauthorized use of the private telephones and Greater Michigan Construction Academy contracted facilities.
- m. Unnecessary conversation or actions causing disruptions to the normal flow of the classroom process.
- n. Safety violations or unsafe activities.
- o. Excessive absence and/or tardiness.
- p. Use of classroom resources (i.e., tools, materials, etc.) for non Greater Michigan Construction Academy classroom work unless prior approval from the instructor or other proper authorities.

## Numeric Grades

Students are expected to maintain satisfactory progress in the related class work. Instructors will promptly furnish reports to GMCA at 10 weeks into the semester as well as at the end. GMCA will report grades to an apprentice's sponsoring employer. The grading scale for semester and final report cards from GMCA will be as follows:

<u>Letter Grade</u>	<u>Percentage</u>
A	93-100%
B	87-92%
C	80-86%
D	70-79%
E	69 or less

A student will not be allowed to advance to the next level of instruction or graduate until all levels are completed at the aforementioned competency levels.

Module performance profiles (hands-on labs) will be graded as pass or fail. Students must pass on all module performance profiles. A student failing a performance profile test must practice and re-test until they can successfully demonstrate those skill requirements according to the criteria outlined in the performance profile test.

GMCA does allow for retesting when students do not achieve the required 70% test grade. A minimum of 48-hour period is required prior to retesting an individual who did not meet the required score on a written test. Students taking their first re-test may have their score raised up to a 70% (no higher). Students taking a second re-test or beyond will be charged a \$25 fee per test. The second re-test must be conducted at the Greater Michigan Construction Academy office between the hours of 8am-5pm. The instructor will be required to communicate with the GMCA staff as to what students need to make up a test and to leave a copy of the test with the GMCA staff.

## Advancement Through Academics (Pass-Thru Testing)

All students may be advanced in a training program if they can prove they have sufficient ability and on the job experience. The procedure for advancement shall be as follows:

- a. All students have the opportunity to "pass thru" the first two levels (two years) of a four or five year program or the first level (first year) of a three year program in accordance with the guidelines established by the NCCER. The requirement established by the NCCER is that in order to receive credit for a level, a student must take all of the module tests for that level. Upon passing the module tests the student will then be given a performance verification test. Therefore, a student wishing to pass-thru Core must take the nine module exams for Core. In order to pass the test, they must obtain a minimum of 80% composite score (with no one module score falling below the required 70%). If the 80% composite is not achieved or one module falls below 70%, the entire semester course must be taken. Once they have taken and passed the Core module tests, they are then eligible to take the module tests for the next section (level one section two, craft specific tests).

After successfully completing the Level One craft specific section, they are then eligible to take the level two tests. Again, a composite score of 80% is required to successfully complete the test process. No one will be permitted to retake a PASS-THRU TEST. A candidate who successfully completes the Core Curriculum may take Pass-Thru Tests for Level 1 and Level 2. The DIRECTOR OF ADMISSIONS & PLACEMENT SERVICES will set the date for the requested PASS-THRU TEST.

- b. There is a fee for each test administered. If the candidate desires to take the core test alone, a fee of \$100 will be assessed. For each test after that (i.e.: Level 1, semester 2; Level 2), an additional fee of \$100 is to be assessed. Again, for each test administered, a fee of \$100 is charged. The candidate shall pay the testing fee prior to the test session unless the company is requesting the bill be forwarded to them. This notification must be made prior to testing.

## Transfer of Credit

For students transferring out, they will receive credit for all NCCER modules passed and verified on the NCCER Registry System.

College credits can be earned in the Craft Training for College Credit (CTCC) program and may be applied toward an Associate of Applied Science degree in Business and Industry Technology at Pima Community College in Tucson, AZ.

The Greater Michigan Construction Academy has an articulation agreement with Davenport University allowing students to receive up to 22 General Business Credits. In order to be granted articulated credit the student must meet the following requirements:

1. The student must earn a 3.0 or higher in each course in order for credit to be articulated.
2. The student must also begin attending Davenport University within 27 months from the date of their graduation.
3. The instructor must sign the articulation submission form which verifies the student has completed the necessary course work to be granted the articulated credit requested.

\*\*Credits articulated will become part of the total number of credits for program completion at Davenport University and will appear on the student's Davenport University transcript by course code and credit hours. No grade will be recorded. Tuition and fees will not be charged for articulated credits.

For students transferring in, they will receive credit for all NCCER modules passed and verified on the NCCER Registry System.

Alignments are available for 10 Army MOS codes, and alignments for other military branches are in development. All alignments are developed in conjunction with military trainers and industry representatives. For more information, please contact the GMCA Director of Admissions & Placement Services.

## Re-Entrance Policy

Greater Michigan Construction Academy reserves the right to deny re-entrance into its classes and premises. All students that wish to be considered for re-entrance must contact the Greater Michigan Construction Academy office and fill out a new application. All decisions will be made by the Vice President. The following are examples of when a student may be considered for re-entrance:

- a. Student withdrew from classes due to a health issue.
- b. Student withdrew from classes due to a move and returned to a training area of the GMCA.
- c. Student was dropped by GMCA due to non-payment of tuition. Tuition and all fees must be paid in full before any consideration will be made for re-entrance. Pre-payment of tuition and fees may be required before re-entrance is allowed.
- d. Student, being withdrawn from the class due to unsatisfactory progress, may be allowed to re-enter the GMCA under certain circumstances:
  1. If the student is sponsored, the employer must petition the Workforce Development Task Force and the GMCA to allow said student back into the Academy. If they are not sponsored, they will be responsible for petitioning the Academy and the Task Force.
  2. The student may be required to take an aptitude exam in the trade they were studying prior to withdrawal. Said test would be administered by the Academy (fees may apply).
  3. The student may obtain a tutor, at their own expense.
  4. If the student is allowed re-entrance, close monitoring of said student's grades and attendance will be given.

A student will not be allowed re-entrance if said student was expelled under the "Student Behavior Expectations" of this catalog.

## Registration \*for Welding see below

New students applying for Greater Michigan Construction Academy classes will need to fill out an enrollment form at the GMCA office or online at gmcami.org.

Craft training at the Greater Michigan Construction Academy is available to anyone wishing to further their career or learn a new trade. Applicants must be at least 16 years of age or is a registered apprentice with the State of Michigan to attend. A high school diploma or GED is not required to enter craft training, however they are highly encouraged. Exceptions to this only apply if student is also applying for a scholarship through GMCA. Please refer the requirements under "Scholarship Program".

Students will not be allowed to register for class after the second week of class.

Returning students may register at the GMCA office or call either (989) 832-8879 or (855) 832-8879 to register by phone.

### FALL REGISTRATION

Registration hours 8:00am - 5:00pm, Monday through Thursday

#### Fall semester: (August - December)

(School closed: Labor Day & Thanksgiving)

### WINTER REGISTRATION

Registration hours 8:00am - 5:00pm, Monday through Thursday

#### Winter semester: (January - May)

#### TUITION:

\$1,500 semester/program. (Based on attending one course per semester-includes all materials, equipment and supplies)

**BOOK FEE:** Will vary (\$70-\$265) **LAB FEE:** Will vary (\$25-\$200)

#### Payment Methods available:

Check ☐ Credit Card ☐ Money Order ☐

#### PAYMENT POLICY

Tuition, book, and lab fees are due before the first day of class.

\*Classes are held Monday thru Thursday from 5:30-9:30 pm. Students attend class one night a week. Class availability is subject to enrollment. Students may enroll in more than one craft. After 90 days all outstanding balances will be forwarded to collection services. Monthly payment plans for tuition are available upon request.

**\*Welding Tuition:** \$10,500

**Class Offered:** September - June

## Calendar \*for Welding see below

#### Fall semester-August - December

#### Winter Semester-January through May

(Classes are held Monday through Thursday from 5:30 - 9:30pm. Students attend class one night a week.)

**Legal Holidays:** New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving and Christmas.

see page next page for details

#### \*Welding Calendar (September - June)

Classes are held Tuesday-Thursday from 8:00-12:00pm

Students attend class 3 days a week.

"This is to certify that this catalog is true and correct in content and policy"

Name: \_\_\_\_\_ Date: \_\_\_\_\_

This certification must be signed by an authorized representative of the institution

## Refund Policy \*for Welding see below

A student will receive a refund upon notice of withdrawal or once there has been a violation of the attendance policy. Tuition refunds will be issued for students who withdraw from the program on the following basis (BOOK PAYMENTS ARE NON-REFUNDABLE)

Student drops before 1st class of semester – 100% refund

No show students – 100% refund

Students who drop during the first week of class, tuition charges withheld will be 6 percent (6%) of tuition.

After the first week and through fifty percent (50%) of the period of financial obligation, tuition charges retained will not exceed a pro rated portion of tuition for the training period complete.

After nine weeks fifty percent (50%) of the period of financial obligation is completed, the institution may retain the full tuition.

GMCA will withhold ten percent (10%) of the unearned tuition for the period of training that was not completed to cover administrative costs. This amount will not exceed \$1000 and is applicable only to students after the first week of class and through 50% of the period of financial obligation.

GMCA will issue refunds within 45 days from the students last day of attendance.

#### Refund Policy for Veterans Only (effective 8/1/2013)

Training of Veterans Under Title 38, United States Code: If a student fails to enter a course or withdraws, or is discontinued there from at any time prior to completion, the amount charged will be an approximate pro-rata portion of the total charges for tuition, registration fee less \$10, and other charges that the length of the completed portion of the course bears to its total length. GMCA will issue refunds within 14 days from the students last day of attendance,

#### \*Welding Refund Policy

Student drops before 1st class of semester – 100% refund

No show students – 100% refund

## Student Records

All student records are located in a secure, electronic central database. Each student is required to sign a Records and Release form at the time of their initial registration. This gives GMCA permission to electronically submit, all grades for each semester, to NCCER so the student may receive their certification for each level they satisfactorily complete. Students receive a copy of their grades at the end of each semester. For any past student that needs a copy of their transcript, a \$10 administrative fee is charged at the time of request.

GMCA follows the FERPA Act and will only disclose information to those listed on the registration and release form, unless it is "directory" information such as a student's name, address, telephone number, date and place of birth, honors and awards, and dates of attendance.

## Drug Testing

All enrollees that are not subject to a company's drug testing program must pass a drug test before beginning classes or receiving confirmation of acceptance into the programs at GMCA. Refusal to submit to testing will result in disqualification of further training consideration. A date prior to the start of semester will be set for potential students to receive their testing.



## Available Space, Facilities & Equipment

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### 7730 W. Wackerly, Midland:

Total Training Square Footage: 20,355

**Core:** basic hand and power tools, blue prints

**Carpentry:** basic tools and materials to complete each module

**Electrical:** 20 training boards, basic tools and materials to complete each module

**Heating and Cooling (HVAC):** furnace, air conditioner, basic tools and materials to complete each module

**Industrial Maintenance Mechanic:** motors, pumps and basic tools and materials to complete each module

**Instrumentation:** training mock up and basic tools and materials to complete each module

**Insulating:** piping set ups; basic tools and materials to complete each module

**Ironworking:** welding equipment, welding safety equipment; basic tools and materials to complete each module

**Millwright:** pumps, motors and basic tools and materials to complete each module

**Pipefitting:** basic tools and materials to complete each module

**Plumbing:** basic tools and materials to complete each module

**Sheet Metal:** air distribution systems, duct work, soldering tools, basic tools and materials to complete each module

**Welding AWS:** welders, welding booths, basic equipment, tools and materials to complete each module

### 5836 Executive Drive, Lansing MI 48911:

**Electrical:** 12 training boards; basic tools and materials to complete each module

**Plumbing:** basic tools and materials to complete each module

**Heating and Cooling (HVAC):** furnace, air conditioner, basic tools and materials to complete each module

**Carpentry:** basic tools and materials to complete each module

**Masonry:** basic tools and materials to complete each module

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### 2775 Shattuck Rd, Saginaw:

**Core/Electrical/General Building & Construction:** basic tools and materials to complete each module