



Montgomery County
CONSTRUCTION TRADES FOUNDATION

Plumbing

The Montgomery County Students Construction Trades Foundation, Inc has developed a comprehensive construction technology program designed to prepare students for a rewarding career in the construction industry. Students master a variety of construction skills by applying knowledge through their participation in a “student design-built” house project. In addition, each program area has articulation agreements with an apprenticeship program as well as Montgomery College.

The apprenticeship program is aligned with the National Center for Construction Education and Research (NCCER) standards. The NCCER is a not-for-profit education foundation created to help address the critical workforce shortage facing the construction industry and to develop industry driven standardized craft training program with portable credentials. For each module, students must score a minimum of 70% on module tests and complete 100% of the Competency Profiles in order to receive NCCER credit. Parentheses indicate the approximate classroom hours spent on each module. Students who enroll in the construction program beyond 2 semesters may have an opportunity to complete optional modules in Level 2 of the NCCER curriculum.

For students who earn a B grade or better, up to seven credits may be transferred to Montgomery College’s Building Trades Technology, A.A.S. or Building Trades Technology Certificate Programs.

The following describes the scope and sequence of instruction for Plumbing.

NCCER Modules-Semester 1	Unit(s)
Module 02101-05	Introduction to the Plumbing Profession (5 hours)
Module 02102-05	Plumbing Safety (20 hours)
Module 02103-05	Plumbing Tools (7.5 hours)
Module 02105-05	Introduction to Plumbing Drawings (12.5 hours)
Module 02106-05	Plastic Pipe and Fittings (10 hours)
Module 02112-05	Introduction to Drain, Waste and Vent (DWV) Systems (10 hours)
Module 02113-05	Introduction to Water Distribution Systems (10 hours)

NCCER Modules-Semester 2	Unit(s)
Module 02104-05	Introduction to Plumbing Math ((7.5 hours)
Module 02107-05	Copper Pipe and Fittings (10 hours)
Module 02108-05	Cast-Iron Pipe and Fittings ((12.5 hours)
Module 02109-05	Carbon Steel, Pipe and Fittings (10 hours)
Module 02110-05	Corrugated Stainless Steel Tubing (2.5 hours)
Module 02111-05	Fixtures and Faucets (5 hours)

NCCER Modules-Semester 3 (Optional)	Unit(s)
Module 02203-05	Hangers, Supports, Structural Penetrations, and Fire Stopping (10 hours)
Module 02204-05	Installing and Testing DWV Piping (25 hours)
Module 02205-05	Installing Roof, Floor, and Area Drains (5 hours)
Module 02206-05	Types of Valves (5 hours)
Module 02207-05	Installing and Testing Water Supply Piping (20 hours)
Module 02212-05	Servicing of Fixtures, Valves, and Faucets (5 hours)

NCCER Modules-Semester 4 (Optional)	Unit(s)
Module 02201-05	Plumbing Math Two (15 hours)
Module 02202-05	Reading Commercial Drawings (20 hours)
Module 02208-05	Installing Fixtures, Valves, and Faucets (20 hours)
Module 02209-05	Introduction to Electricity (15 hours)
Module 02210-05	Installing Water Heaters (5 hours)
Module 02211-05	Fuel Gas Systems (20 hours)

LEVEL 1

MODULE 02101-05 INTRODUCTION TO THE PLUMBING PROFESSION

1. Describe the history of the plumbing profession.
2. Identify the responsibilities of a person working in the construction industry.
3. State the personal characteristics of a professional.
4. Identify the stages of progress within the plumbing profession and its positive impact on society.

MODULE 02102-05 PLUMBING SAFETY

1. Describe the common unsafe acts and unsafe conditions that cause accidents.
2. Describe how to handle unsafe acts and unsafe conditions.
3. Explain how the cost of accidents and illnesses affects everyone on site.
4. Demonstrate the use and care of appropriate personal protective equipment.
5. Identify job-site hazardous work specific to plumbers.
6. Demonstrate the proper use of ladders.
7. Demonstrate how to maintain power tools safely.
8. Explain how to work safely in and around a trench.
9. Describe and demonstrate the lockout/tagout process.

MODULE 02103-05 PLUMBING TOOLS

1. Identify the basic hand and power tools used in the plumbing trade.
2. Demonstrate the proper use of plumbing tools.
3. Demonstrate the ability to know when and how to select the proper tool(s) for tasks.
4. Demonstrate the proper maintenance for caring for hand and power tools.
5. Demonstrate how to prepare a surface for tool use.
6. Describe the safety requirements for using plumbing tools.

MODULE 02105-05 INTRODUCTION TO PLUMBING DRAWINGS

1. Identify pictorial (isometric and oblique), schematic, and orthographic drawings, and discuss how different views are used to depict information about objects.
2. Identify the basic symbols used in schematic drawings of pipe assemblies.
3. Explain the types of drawings that may be included in a set of plumbing drawings and the relationship among the different drawings.
4. Interpret plumbing-related information from a set of plumbing drawings.
5. Sketch orthographic and schematic drawings.
6. Use an architect's scale to draw lines to scale and to measure lines drawn to scale.
7. Discuss how code requirements apply to certain drawings.

MODULE 02106-05 PLASTIC PIPE AND FITTINGS

1. Identify types of materials and schedules of plastic piping.
2. Identify proper and improper applications of plastic piping.
3. Identify types of fittings and valves used with plastic piping.
4. Identify and determine the kinds of hangers and supports needed for plastic piping.

5. Identify the various techniques used in hanging and supporting plastic piping.
6. Properly measure, cut, and join plastic piping.
7. Explain proper procedures for the handling, storage, and protection of plastic pipes.

MODULE 02112-05 INTRODUCTION TO DRAIN, WASTE, AND VENT (DWV) SYSTEMS

1. Explain how waste moves from a fixture through the drain system to the environment.
2. Identify the major components of a drainage system and describe their functions.
3. Identify the different types of traps and their components, explain the importance of traps, and identify the ways that traps can lose their seals.
4. Identify the various types of drain, waste, and vent (DWV) fittings and describe their applications.
5. Identify significant code and health issues, violations, and consequences related to DWV systems.

MODULE 02113-05 INTRODUCTION TO WATER DISTRIBUTION SYSTEMS

1. Describe the process by which water is distributed in municipal, residential, and private water systems.
2. Identify the major components of a water distribution system, and describe the function of each component.
3. Explain the relationships between components of a water distribution system.

MODULE 02104-05 INTRODUCTION TO PLUMBING MATH

1. Add, subtract, multiply, and divide whole numbers.
2. Add, subtract, multiply, and divide fractions.
3. Add, subtract, multiply, and divide decimals.
4. Convert decimals to percentages and percentages to decimals.
5. Convert fractions to decimals and decimals to fractions.
6. Explain what the metric system is and how it is important in the plumbing trade.
7. Square various numbers and take square roots of numbers, with and without a calculator.
8. Identify the parts of a fitting and use common pipe-measuring techniques.
9. Use fitting dimension tables to determine fitting allowances and thread makeup.
10. Calculate end-to-end measurements using fitting allowances and thread makeup.

MODULE 02107-05 COPPER PIPE AND FITTINGS

1. Identify the types of materials and schedules used with copper piping.
2. Identify the material properties, storage, and handling requirements of copper piping.
3. Identify the types of fittings and valves used with copper piping.
4. Identify the techniques used in hanging and supporting copper piping.
5. Properly measure, ream, cut, and join copper piping.
6. Identify the hazards and safety precautions associated with copper piping.

MODULE 02108-05 CAST-IRON PIPE AND FITTINGS

1. Recognize proper and improper applications of cast-iron piping.
2. Identify the material properties, storage, and handling requirements of carbon steel piping.
3. Identify the types of materials and schedules used in cast-iron piping.
4. Identify the types of fittings used with cast-iron piping.
5. Identify the various techniques used in handling and supporting cast-iron piping.
6. Properly measure, cut, and join cast-iron piping.
7. Identify the hazards and safety precautions associated with cast-iron piping.

MODULE 02109-05 CARBON STEEL PIPE AND FITTINGS

1. Recognize proper applications of carbon steel piping.
2. Identify the material properties, storage, and handling requirements of carbon steel piping.
3. Identify the various techniques used in hanging and supporting carbon steel piping.
4. Properly measure, cut, groove, thread, and join carbon steel piping.

MODULE 02110-05 CORRUGATED STAINLESS STEEL TUBING

1. Identify the common manufacturers of corrugated stainless steel tubing.
2. Recognize proper and improper applications of corrugated stainless steel tubing.
3. Identify the various techniques used in hanging and supporting corrugated stainless steel tubing.
4. Explain how to properly measure, cut, join, and groove corrugated stainless steel tubing.
5. Identify the material properties, storage, and handling requirements of corrugated stainless steel tubing.

MODULE 02111-05 FIXTURES AND FAUCETS

1. Identify the basic types of materials used in the manufacture of plumbing fixtures.
2. Discuss common types of sinks, lavatories, and faucets.
3. Identify and discuss common types of bathtubs, bath-shower modules, shower stalls, and shower baths.
4. Discuss common types of toilets, urinals, and bidets.
5. Identify and describe common types of drinking fountains and water coolers.
6. Discuss common types of garbage disposals and domestic dishwashers.

LEVEL 2

MODULE 02203-05 HANGERS, SUPPORTS, STRUCTURAL PENETRATIONS AND FIRE STOPPING

1. Identify the hangers and supports used to install DWV and water supply systems and explain their applications.

2. Install pipe hangers and supports correctly according to local applicable codes and manufacturer's specifications.
3. Modify structural members using the appropriate tools without weakening the structure.
4. Identify and install common types of fire-stopping materials used in penetrations through fire-rated structural members, walls, floors, and ceilings.

MODULE 02204-05 INSTALLING AND TESTING DWV PIPING

1. Develop a material takeoff from a given set of plans.
2. Use plans and fixture rough-in sheets to determine location of fixtures and route of the plumbing.
3. Demonstrate the ability to install a building sewer.
4. Locate the stack within the structure.
5. Demonstrate the ability to install a DWV system using appropriate hangers and correct grade.
6. Demonstrate the ability to modify structural members using the appropriate tools without weakening the structure.
7. Demonstrate the ability to test a DWV system.

MODULE 02205-05 INSTALLING ROOF, FLOOR, AND AREA DRAINS

1. Use a surveyor's level or transit level to set the elevation of a floor or area drain.
2. Install a roof, floor, and area drain.
3. Install waterproof membranes and flashing.

MODULE 02206-05 TYPES OF VALVES

1. Identify the basic types of valves.
2. Describe the differences in pressure ratings for valves.
3. Demonstrate the ability to service various types of valves.

MODULE 02207-05 INSTALLING AND TESTING WATER SUPPLY PIPING

1. Develop a material takeoff from a given set of plans.
2. Use plans and fixture rough-in sheets to determine the location of fixtures and the route of the water supply piping.
3. Demonstrate the ability to locate and size a water meter.
4. Demonstrate the ability to locate a water heater, water softener, and hose bibbs.
5. Demonstrate the ability to install a water distribution system using appropriate hangers.
6. Modify structural members, using the appropriate tools, without weakening the structure.
7. Demonstrate the ability to safely size and install a water service line and provide for water hammer protection.
8. Demonstrate the ability to test a water supply system.

MODULE 02212-05 SERVICING OF FIXTURES, VALVES, AND FAUCETS

1. Identify common repair and maintenance requirements for fixtures, valves, and faucets.
2. Identify the proper procedures for repairing and maintaining fixtures, valves, and faucets.

MODULE 02201-05 PLUMBING MATH TWO

1. Lay out square corners using the 3-4-5 method.
2. Use a folding rule to find given angles.
3. Calculate 11-1/4, 22-1/2, 60, and 72-degree simple offsets.
4. Calculate 11-1/4, 22-1/2, 60, and 72-degree parallel offsets.
5. Calculate rolling offsets using constants for the angled fittings.
6. Use a calculator to find a square root.
7. Calculate rolling offsets using a framing square.
8. Calculate 45-degree offsets around obstructions.

MODULE 02202-05 READING COMMERCIAL DRAWINGS

1. Interpret information from given site plans.
2. Verify dimensions shown on drawings and generate a Request for Information (RFI) when you find discrepancies.
3. Locate plumbing entry points, walls, and chases.
4. Create an isometric drawing.
5. Do a material takeoff for drainage, waste, and vent (DWV) and water supply systems from information shown on drawings.
6. Use cut sheets and floor plans to lay out fixture rough-ins.

MODULE 02208-05 INSTALLING FIXTURES, VALVES, AND FAUCETS

1. Describe the general procedures you should follow before installing any fixture.
2. Demonstrate the ability to install bathtubs, shower stalls, valves, and faucets.
3. Demonstrate the ability to install water closets and urinals.
4. Demonstrate the ability to install lavatories, sinks, and pop-up drains.
5. Demonstrate how to protect fixtures.

MODULE 02209-05 BASIC ELECTRICITY

1. State and demonstrate the safety precautions that must be followed when working on electrical equipment.
2. State how electrical power is generated and distributed.
3. Describe how voltage, current, resistance, and power are related.
4. Use Ohm's law to calculate the current, voltage, and resistance in a circuit.
5. Use the power formula to calculate how much power is consumed by a circuit.
6. Describe the differences between series and parallel circuits.
7. Recognize and describe the purpose and operation of the various electrical components used in plumbing equipment.

8. Take voltage, current, and resistance measurements using electrical test equipment. Determine the positioning of leads. Test a fuse for continuity.
9. Explain and understand electrical symbols.

MODULE 02210-05 INSTALLING WATER HEATERS

1. Describe the basic operation of water heaters.
2. Identify and explain the functions of the basic components of water heaters.
3. Install an electric water heater.
4. Install a gas water heater.
5. Describe the safety hazards associated with water heaters.

MODULE 02211-05 FUEL GAS SYSTEMS

1. Identify the major components of the following fuel systems and describe the function of each component:
 - Natural gas
 - LPG (liquefied petroleum gas)
 - Fuel oil
2. Identify the physical properties of each type of fuel.
3. Identify the safety precautions and potential hazards associated with each type of fuel and system.
4. Properly connect appliances to the fuel gas system.
5. Apply local codes to various fuel gas systems.
6. Design, size, purge, and test fuel gas systems.