

FLATHEAD VALLEY COMMUNITY COLLEGE

AGENDA ITEM *6

V. COLLEGE ISSUES

B. Program Proposal

BACKGROUND:

- Plumbing Apprentice, Certificate of Technical Studies

FVCC launched a non-credit Montana Registered Plumbing Apprenticeship program in the 2022-23 Academic Year in response to repeated and strong requests from local plumbing businesses. Approval for FVCC to deliver the Related Technical Instruction (RTI) was secured from the State of Montana Department of Labor and Industry. The approved program is three years long and includes 144 hours of RTI. All students are required to secure a plumbing business sponsorship before they can begin.

The first cohort began in Fall 2023 with 15 students. The second cohort began in Fall 2024 with 13 students. An advisory board was formed that currently includes the following members: Central Heating, Cooling and Plumbing, Plumb-Rite Plumbing, Mildren Plumbing, Flathead County Plumbing, and Murdock Plumbing.

Strong interest in the program continues. The advisory board met on March 14, 2025 and advised a move to a credit format to better support students in their ability to participate in the Plumbing Apprentice program.

The program outline is presented to the Board of Trustees for consideration of approval as a credit program offered through the FVCC Trades Institute.

Plumbing Apprenticeship, Certificate of Technical Studies (18 credit hours)

Completion of this program satisfies the Montana Department of Labor and Industry requirement for the educational component of the plumbing apprenticeship program; it is intended only for currently registered plumbing apprentices.

The program is scheduled for a succession of six semesters, fall and spring. In conjunction with the required work experience, this program provides students with the training necessary to work in the field of plumbing in residential, commercial, and industrial applications.

The Montana apprenticeship requirement of 144 hours of “Related Technical Instruction” provided by FVCC is embedded in this course sequence and previously approved by the Montana Registered Apprenticeship Program, Montana Department of Labor and Industry.

FIRST YEAR

Fall Semester

PLUM 100 – Plumbing Apprenticeship I (NCCER Level 1) *[PLUM 100](#)

Credits: (3 credits | 3 lecture)

Course Description: This course is for plumbing apprentices in their **first year** of their apprenticeship program. Apprentices/students must be in a registered apprenticeship or have instructor permission to enroll in this class.

In this initial course of the FVCC Plumbing Apprenticeship Program, apprentices will begin to learn about the Uniform Plumbing Code (UPC) and Montana Code Annotated (MCA) as well as cover the following NCCER modules: Introduction to the Plumbing Profession; Plumbing Safety; Tools of the Plumbing Trade; Introduction to Plumbing Math; Introduction to Plumbing Drawings, and Plastic Pipe and Fittings. Students may have the option to test with NCCER-certified master instructors in order to earn related NCCER credentials, but any such testing falls outside the scope of this course and program. This course is approved as an official Related Technical Instruction by Montana Registered Apprenticeship for registered Plumbing Apprenticeship programs.

Learning Outcomes:

When you have completed this course, you will be able to do the following:

1. Understand the core components of the Uniform Plumbing Code and Montana Code Annotated, and how to use the code book and resources effectively.
2. Describe the plumbing profession and identify the responsibilities of a person working in the plumbing industry.
3. Identify methods for preventing accidents as well as the safety precautions required when using tools of the trade in various work areas.
4. Describe hand and power tools used in the plumbing trade.
5. Perform basic mathematical calculations and explain how pipe is measured.

6. Understand how to read drawings and how to identify the different types of drawings used to install plumbing systems.
7. Identify the types, uses, and properties of plastic pipe and fittings.
8. Describe the different methods for joining, supporting, protecting, and testing plastic pipes.
9. Apply code knowledge to assess compliance in plumbing installations.
10. Prepare for licensing exams by demonstrating code fluency in relevant code.
11. Interpret relevant sections of the Uniform Plumbing Code (UPC) and Montana Code Annotated.

Spring Semester

PLUM 102 – Plumbing Apprenticeship II (NCCER Level 1) *PLUM 120;125

Credits: (3 credits | 3 lecture)

Course Description: This course is for plumbing apprentices in their **first year** of their apprenticeship program. Apprentices/students must be in a registered apprenticeship or have instructor permission to enroll in this class.

In the second course of the FVCC Plumbing Apprenticeship Program, apprentices will continue to learn about the Uniform Plumbing Code (UPC) and Montana Code Annotated (MCA) as well as cover the following NCCER modules: Copper Tube and Fittings; Cast Iron Pipe and Fittings; Steel Pipe and Fittings; Introduction to Plumbing Fixtures; Introduction to Drain, Waste, and Vent (DWV) Systems; and Introduction to Water Distribution Systems. Apprentices will also begin developing specific math skills and understanding needed for being successful in plumbing-related fields. This course is approved as an official Related Technical Instruction by Montana Registered Apprenticeship for registered Plumbing Apprenticeship programs.

Learning Outcomes:

When you have completed this course, you will be able to do the following:

1. Understand core components of the Uniform Plumbing Code and Montana Code Annotated, and how to use the code book and resources effectively for given scenarios.
2. Understand basic concepts of pipe length conversion, angles and offsets, water measure and calculating water pressure.
3. Describe the methods used to install and test copper tube and steel pipe.
4. Describe methods for supporting, installing, and testing horizontal and vertical pipe runs.
5. Identify and describe the various plumbing fixtures.
6. Describe DWV fittings and their applications.
7. Identify the major components of a water distribution system and describe the function of each.
8. Explain the relationship between the components of a water distribution system.
9. Apply code knowledge to assess compliance in plumbing installations.
10. Prepare for licensing exams by demonstrating code fluency in relevant code.
11. Interpret relevant sections of the Uniform Plumbing Code (UPC) and Montana Code Annotated.

SECOND YEAR

Fall Semester

PLUM 103: Plumbing Apprenticeship III (NCCER Level 2-3)

Credits: (3 credits | 3 lecture)

This course is for plumbing apprentices in their **second year** of their apprenticeship program. Apprentices/students must be in a registered apprenticeship or have instructor permission to enroll in this class.

Apprentices explore *Mathematics for Plumbers and Pipefitters* and develop and/or advance specific math skills and understandings needed for success in plumbing-related applications. They apply these understandings to the Uniform Plumbing Code and Montana Code Annotated as well as cover the following NCCER modules: Plumbing Math Two; Reading Commercial Drawings; Structural Penetrations, Insulation, and Firestopping; Installing and Testing DWV Piping; Installing Roof, Floor, and Area Drains; Installing and Testing Water Supply Piping; Types of Valves; Installing Fixtures and Valves; Installing Water Heaters; Basic Electricity; and Fuel Gas and Fuel Oil Systems.

Learning Outcomes:

1. Explain the Pythagorean theorem and methods for laying out square corners.
2. Outline techniques to calculate simple and rolling offsets/offsets on parallel runs of pipe.
3. Ability to read and interpret commercial drawings.
4. Apply methods for adjusting structural members, insulating pipes, and fire-stopping installation.
5. Measure, cut, and install fiberglass and flexible foam insulation.
6. Identify walls, floors, and ceilings that need firestopping.
7. Explain how to locate, install, connect, and test a complete drain, waste and vent (DWV) system.
8. Employ proper techniques for locating, installing, and connecting roof, floor, and area drains and floor sinks to code.
9. Delineate types of valves, their components, and applications.
10. Employ proper techniques for installing gas-fired, electric, tankless, heat pump, and indirect water heaters.
11. Install basic plumbing fixtures, valves, faucets, and components.
12. Apply foundational concepts of electrical safety when installing water heaters.
13. Apply techniques and safe handling of natural gas, liquefied petroleum gas, and fuel oil.
14. Apply code knowledge to assess compliance in plumbing installations.
15. Prepare for licensing exams by demonstrating code fluency in relevant code.
16. Interpret relevant sections of the Uniform Plumbing Code (UPC) and Montana Code Annotated.

Spring Semester

Special Topics: PLUM 104 – Plumbing Apprenticeship IV (NCCER Level 3)

Credits: (3 credits | 3 lecture)

Class Meeting Days & Times: Wednesdays, 5:00 – 8:00 PM, for 16 weeks

Course Description: This course is for plumbing apprentices in their **second year** of their apprenticeship program. Apprentices/students must be in a registered apprenticeship or have instructor permission to enroll in this class.

In this fourth course of the FVCC Plumbing Apprenticeship Program, apprentices will work through all *NCCER Plumbing Level 3*, with specific instruction on the following modules: Applied Math, Potable Water Supply Treatment, Types of Venting, Sizing DWV and Storm Systems, Sewage Pumps and Sump Pumps, Corrosive-Resistant Waste Piping, Sizing and Protecting the Water Supply System, Service Plumbing, and Compressed Air. Instruction will also continue on the Uniform Plumbing Code and Montana Code Annotated related to technical instruction and on the job training per Montana Registered Apprenticeship for registered Plumbing Apprenticeship programs.

Learning Outcomes:

1. Describe corrosive wastes, how to handle them safely, and how to join and install different types of corrosive-resistant waste piping.
2. Identify and describe how to measure and the practical applications of area and volume in plumbing as well as the concepts of temperature and pressure in plumbing installations.
3. Determine factors that affect the sizing of water supply systems and how to size them for different acceptable flow rates as well as calculate pressure drops and describe backflow prevention devices.
4. Identify the methods for disinfecting, filtering, and softening the water supply, and determine the sources of contamination they address as well as how to troubleshoot water supply problems caused by contamination.
5. Describe the principles and components of vent systems and their code requirements as well as the different types of vent systems plumbers install.
6. Describe how to size drain, waste, vent, and storm drainage systems.
7. Describe the components of, how to size and install, and how to troubleshoot and repair sewage and stormwater removal systems.
8. Recognize and observe standards of safety and etiquette when making service calls as well as explain how to troubleshoot and repair problems with water supply systems, fixtures, appliances and DWV systems.
9. Apply code knowledge to assess compliance in plumbing installations.
10. Prepare for licensing exams by demonstrating code fluency in relevant code.
11. Interpret relevant sections of the Uniform Plumbing Code (UPC) and Montana Code Annotated.

THIRD YEAR

Fall Semester

PLUM 105: Plumbing Apprenticeship V (NCCER Level 4)

Credits: (3 credits | 3 lecture)

This course is for plumbing apprentices in their **third year** of their apprenticeship program. Apprentices/students must be in a registered apprenticeship or have instructor permission to enroll in this class.

Class Description: In the fifth course of the FVCC Plumbing Apprenticeship Program, apprentices will finish *Mathematics for Plumbers and Pipefitters* while continuing to review the Uniform Plumbing Code and Montana Code Annotated, in addition to covering the following NCCER modules: Business Principles for Plumbers; Fundamentals of Crew Leadership; Water Pressure Booster and Recirculation Systems;

Indirect and Special Waste; and Hydronic and Solar Heating Systems. Will begin using *IAPMO Illustrated Training Manual* for code work.

Learning Outcomes:

1. Identify types of indirect and special waste systems.
2. Describe design principles and proper installation methods.
3. Interpret code requirements for indirect waste connections and air gaps.
4. Explain the operation and components of hydronic heating systems.
5. Demonstrate knowledge of solar water heating system design and applications.
6. Perform basic troubleshooting and maintenance on heating systems.
7. Describe the components and operation of private well systems.
8. Identify installation practices and safety considerations.
9. Analyze potential issues with water quality and pump systems.
10. Explain the function and design of septic tanks and other private waste systems.
11. Apply code regulations related to installation and environmental protection to evaluate system performance and maintenance requirements.
12. Identify types of medical gas and vacuum systems used in healthcare facilities.
13. Understand basic safety protocols and code requirements and responsibilities of installers
14. Interpret relevant sections of the Uniform Plumbing Code (UPC) and Montana Code Annotated.
15. Apply code knowledge to assess compliance in plumbing installations.
16. Prepare for licensing exams by demonstrating code fluency.
17. Interpret relevant sections of the Uniform Plumbing Code (UPC) and Montana Code Annotated.

Spring Semester

PLUM 106 – Plumbing Apprenticeship VI (NCCER Level 4)

Credits: (3 credits | 3 lecture)

This course is for plumbing apprentices in their **third year** of their apprenticeship program. Apprentices/students must be in a registered apprenticeship or have instructor permission to enroll in this class.

Class Description: In this sixth and final course of the FVCC Plumbing Apprenticeship Program, apprentices will finish *NCCER Plumbing Level 4*, while continuing to review the Uniform Plumbing Code and Montana Code Annotated. The following NCCER modules: Private Water Supply Systems, Private Waste-Disposal Systems, Swimming Pools and Hot Tubs, Plumbing for Mobile Homes and Travel Trailers, and Introduction to Medical Gas and Vacuum Systems will be completed. Students will continue utilizing the *IAPMO Illustrated Training Manual* and *IAPMO Study Guide* for preparation of licensing exam and distinguishing select code work in addition to reviewing connected resources for exam preparation, code review, and all related licensing processes.

Learning Outcomes:

1. Explain how to drill good wells, including location, size and construction technics.
2. Explain the operation of various types of pumps and pump components including shallow-well and deep-well jet pumps in addition to submersible pumps.
3. Explain how to select and install water supply and storage components.
4. Describe the types of private waste-disposal systems.

5. Explain how to locate and size private waste-disposal systems.
6. Explain how to install private waste-disposal systems.
7. Explain how to size and install swimming pool systems and components.
8. Identify hot tub and spa systems and their components.
9. Describe water supply and DWV systems for mobile home parks.
10. Identify the safety issues related to medical gas and vacuum system installation.
11. Apply code knowledge to assess compliance in plumbing installations.
12. Interpret relevant sections of the Uniform Plumbing Code (UPC) and Montana Code Annotated.
13. Prepare for licensing exams by demonstrating code fluency in relevant code.

Per Montana Department of Industry and Labor and the State Board of Plumbers, apprentices will be eligible to sit for the journeyman exam upon completion of the FVCC Plumbing Apprenticeship Program if they have accrued a minimum of 6,000 hours of on-the-job training.

***The asterisk denotes a course offered by Montana State University - Northern that maps onto learning outcomes by 80% or more.**