

**COURSE OUTLINE****Course:** 71314 2ND YEAR PLUMBING APPRENTICE**Total Course Hours:** 720.00**CBEDS Title:** PLUMBING**CBEDS #:** 5524**Job Title(s):**

Plumber, Plumber's Helper, Plumbing Apprentice, Plumbing Wholesale, New Construction Service and Repair

**Prerequisites:**

16 years old or a junior in high school

**Course Description:**

This course provides related instruction from entry-level to upgrade training in the four levels of plumbing apprenticeship. Instruction covers the following areas: installation and repair of water lines, waste disposal, drainage, and gas systems in homes, commercial and industrial buildings. Students also learn fixture installation - bathtubs, showers, sinks, water closets - and appliances such as dishwashers and water heaters. Students also learn high and low pressure pipe systems used in manufacturing, heating and cooling. Integrated throughout the course are Academic and CTE standards, which include safety, communication, technology, ethics, career planning and other employability skills.

Hours	
Class	OJT

**Occupational Competencies****1-7 on the Course Outline are generic to all BVROP courses and include the BVROP Student Outcomes**

3.00	3.00	<b>1</b>	<b><u>ORIENTATION</u></b>	<ul style="list-style-type: none"> <li>A Identifies and discusses course objectives and competencies.</li> <li>B Discusses ROP Student Outcomes.</li> <li>C Explains class attendance and behavior objectives.</li> </ul>
3.00	3.00	<b>2</b>	<b><u>HEALTH, SAFETY AND ENVIRONMENTAL MANAGEMENT</u></b>	<ul style="list-style-type: none"> <li>A Describes accident procedure.</li> <li>B Demonstrates appropriate safety practices (e.g. bending, lifting, etc.).</li> <li>C Demonstrates knowledge of classroom procedures and drills (e.g. earthquake, fire and emergency).</li> </ul>
3.00	3.00	<b>3</b>	<b><u>ETHICS AND LEGAL RESPONSIBILITIES</u></b>	<ul style="list-style-type: none"> <li>A Defines sexual harassment and discusses tactics for handling harassment situations.</li> <li>B Applies appropriate workplace behavior and standards.</li> </ul>
3.00	3.00	<b>4</b>	<b><u>LEADERSHIP AND TEAMWORK</u></b>	<ul style="list-style-type: none"> <li>A Describes the characteristics and benefits of teamwork and leadership.</li> <li>B Demonstrates ability to make appropriate decisions.</li> <li>C Works well with others and gives/takes constructive criticism.</li> </ul>
15.00	15.00	<b>5</b>	<b><u>CAREER PLANNING</u></b>	<ul style="list-style-type: none"> <li>A Prepares a finished, professional portfolio showing the best work that has been completed during the class.</li> <li>B Locates job opportunities through the use of want-ads and placement agencies.</li> <li>C Visits at least one facility related to area of training and observes jobs performed.</li> <li>D Completes a job application correctly.</li> <li>E Prepares for and critiques a simulated employment interview.</li> <li>F Discusses employee benefits and rights as related to the specific occupational job area including gender equity and equal opportunity.</li> <li>G Identifies acceptable procedures to leave a job.</li> <li>H Applies for a scholarship.</li> <li>I Completes a professional resume.</li> <li>J Demonstrates appropriate personal grooming and dress.</li> </ul>

Hours	
Class	OJT

3.00	3.00
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**6 COMMUNICATION**

- A Uses effective workplace conversation.
- B Reads and interprets written information and directions.
- C Practices various forms of written communication appropriate to the occupation.

5.00	5.00
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**7 STUDENT OUTCOMES**

- A Demonstrates Occupational Specific, Communication and Critical Thinking Skills
- B Demonstrates Responsible Work Ethics
- C Demonstrates Career/Employment Literacy
- D Demonstrates Effective Use of Technology

25.00	25.00
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**8 MATH CONCEPTS**

- A Adds, subtracts, multiplies and divides whole numbers with and without a calculator.
- B Uses a standard and metric ruler to measure.
- C Adds, subtracts, multiplies and divides fractions.
- D Adds, subtracts, multiplies and divides whole decimals with and without a calculator.
- E Converts decimals to percents and percents to decimals.
- F Converts fractions to decimals and decimals to fractions.
- G Describes and applies the Metric System and its importance in the construction industry.
- H Recognizes and uses metric units of length, weight, volume and temperature.
- I Lays out square corners using the 3-4-5 method.
- J Calculates 11 1/4, 22 1/2, 60 and 72 degree simple offsets.
- K Calculates 11 1/4, 22 1/2, 60 and 72 degree parallel offsets.
- L Calculates rolling offsets using constants for the angled fittings.
- M Uses a calculator to find square root.
- N Calculates rolling offsets using a framing square.
- O Calculates 45-degree offsets around obstructions.

25.00	25.00
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**9 HAND TOOLS**

- A Recognizes, selects and uses proper basic hand tools for all jobs.
- B Safely uses basic hand tools in all job procedures.
- C Understands the importance of and applies basic maintenance procedures for hand tools.

20.00	20.00
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**10 POWER TOOLS**

- A Identifies and uses correct power tools on the job.
- B Recognizes and applies appropriate safety guidelines when working with power tools.
- C Describes and applies proper procedures for maintaining power tools.

10.00	10.00
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**11 BLUEPRINT READING**

- A Identifies and recognizes basic blueprint terms and symbols.
- B Relates information on prints to real parts and locations.
- C Interprets information from given site plans.
- D Verifies dimensions shown on drawings and generates a Request for Information (RFI) when discrepancies are found.
- E Locates plumbing entry points for walls and chases.
- F Creates isometric drawings.
- G Does a material takeoff for drainage, waste and vent (DWV) and water supply systems from blueprints.
- H Uses cut sheets and floor plans to lay out fixture rough-ins.

25.00	25.00
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**12 INSTALLING AND TESTING DWV PIPING**

- A Develops a material takeoff from a given set of plans.
- B Uses plans and fixture rough-in-sheets to determine location of fixtures and routes for plumbing.
- C Demonstrates the ability to install a building sewer system.
- D Locates stack within the structure.
- E Demonstrates the ability to install a DWV system using appropriate hangers and correct grading.
- F Demonstrates testing of a DWV system.

Hours	
Class	OJT

15.00	15.00	<b>13 VALVES</b>
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- A Identifies and uses basic valves.
- B Describes and understands the differences in pressure ratings for various valves.
- C Services various types of valves.

15.00	15.00	<b>14 INSTALLING AND TESTING WATER SUPPLY PIPING</b>
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- A Develops a material takeoff from a given set of plans.
- B Uses plans and fixture rough-in-sheets to determine location of fixtures and routes for plumbing.
- C Is able to locate and size a water meter.
- D Is able to locate a water heater, water softener and hose bibbs.
- E Is able to install a water distribution system using the appropriate hangers.
- F Demonstrates installation of water service including safe sizing to provide for water hammer protection.
- G Is able to properly test a water supply system.

15.00	15.00	<b>15 INSTALLING FIXTURES, VALVES, and FAUCETS</b>
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- A Describes and uses the general procedures for installing fixtures.
- B Demonstrates the proper installation of bathtubs, shower stalls, valves and faucets.
- C Demonstrates the proper procedures for installing water closets.
- D Demonstrates the proper procedures for installing lavatories, sinks and pop-up drains.
- E Demonstrates the proper procedures for protecting fixtures.

15.00	15.00	<b>16 INSTALLING WATER HEATERS</b>
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- A Describes the basic operation of water heaters.
- B Identifies and explains the functions of basic components of a water heater.
- C Properly installs gas and electric water heaters.
- D Describes and understands the safety hazards associated with water heaters.

20.00	20.00	<b>17 FUEL GAS SYSTEMS</b>
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- A Identifies the major components of fuel gas systems and the differences between Natural Gas, and LPG.
- B Describes and understands the physical properties of each type of fuel gas.
- C Identifies and uses safety precautions associated with each type of fuel gas system.
- D Makes proper connections for appliances for each type of fuel gas system.
- E Understands and applies local codes to various fuel gas systems.
- F Designs, sizes and tests fuel gas systems.

10.00	10.00	<b>18 SERVICING FIXTURES, VALVES, and FAUCETS</b>
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- A Identifies and describes procedures for common repairs and maintenance requirements for fixtures, valves and faucets.
- B Identifies and uses proper procedures for repairing and maintaining fixtures, valves and faucets.

15.00	15.00	<b>19 PLUMBING THEORIES</b>
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- A Calculates the change in volume of air when pressure is applied.
- B Describes the effects of pressure being applied to water.
- C Describes the effects of excessive temperature in a water heater.
- D Identifies and uses local plumbing codes directly related to pressure, temperature or volume.
- E Identifies and uses local plumbing code requirements related to pressures, temperature or volume.
- F Calculates the pressure exerted by a column of water.
- G Describes and understands why buoyancy is an important concept in plumbing.
- H Calculates friction losses.
- I Describes and understands the principles of water closet operations.
- J Identifies and uses local plumbing codes related to flow of liquids in pressure piping.
- K Identifies and uses local plumbing codes related to flow of liquids in horizontal and vertical waste piping.
- L Identifies and understands factors which promote the smooth flow of waste through waste piping.
- M Describes the relationship between plumbing design, code and installation practices.
- N Identifies and understands local code requirements for cross connections.
- O Relates and applies crossconnection to typical plumbing installation practices.

Hours	
Class	OJT

10.00	10.00	<p><b>20 <u>ON-THE-JOB TASK ORGANIZATION</u></b></p> <p><b>A</b> Understands and applies positive attitude and how this contributes to overall job success and productivity.</p> <p><b>B</b> Understands and uses effective communication skills.</p> <p><b>C</b> Understands and applies the relationship of safety and the cost of plumbing work.</p> <p><b>D</b> Understands the proper use of company vehicles.</p> <p><b>E</b> Describes and uses the task planning process.</p> <p><b>F</b> Identifies key questions that should be asked during the task planning process.</p> <p><b>G</b> Completes task planning forms for a typical job.</p> <p><b>H</b> Completes a cost control analysis of a typical plumbing task.</p>
15.00	15.00	<p><b>21 <u>STORM DRAINAGE SYSTEMS</u></b></p> <p><b>A</b> Understands and uses the variations in rainfall and the effects on storm drainage systems.</p> <p><b>B</b> Understands the various methods of storm water retention methods.</p>
15.00	15.00	<p><b>22 <u>VENTS</u></b></p> <p><b>A</b> Explains and understands the general requirements for applications of vents.</p> <p><b>B</b> Understands the use of vents in plumbing systems.</p> <p><b>C</b> Identifies and explains the sizing requirements for the special kinds of vents used in plumbing.</p> <p><b>D</b> Explains the sizing requirements for individual vents, common vents, wet vents, and combined waste and wet vent installations.</p> <p><b>E</b> Explains the sizing requirements for battery vented systems.</p> <p><b>F</b> Explains the general considerations for vent sizing which apply to any system.</p> <p><b>G</b> Sizes vents according to local codes.</p>
15.00	15.00	<p><b>23 <u>DRAINAGE SYSTEMS</u></b></p> <p><b>A</b> Describes and understands flow in branch lines and stacks in drainage systems.</p> <p><b>B</b> Calculates drainage fixture units for a plumbing system.</p> <p><b>C</b> Sizes branch lines for the drainage of plumbing fixtures and groups of fixtures.</p> <p><b>D</b> Sizes waste stacks and drain lines for a given structure.</p> <p><b>E</b> Identifies and understands the limitations for waste stacks and drain lines in a given structure.</p> <p><b>F</b> Sizes building drains and sewers.</p> <p><b>G</b> Identifies the various special considerations associated with building drains and sewers.</p> <p><b>H</b> Assigns drainage fixture units to individual fixtures and groups of fixtures.</p> <p><b>I</b> Sizes the lateral branches, stacks, and building drains for a given building.</p>
15.00	15.00	<p><b>24 <u>COMBINATION WASTE AND VENT SYSTEMS</u></b></p> <p><b>A</b> Identifies and understands the applications and limitations of combination waste and vent systems.</p> <p><b>B</b> Sizes combination waste and vent systems.</p> <p><b>C</b> Designs and lays out a combination waste and vent system.</p> <p><b>D</b> Designs and installs a combination waste and vent system along with a conventional waste disposal system.</p> <p><b>E</b> Designs a combination waste and vent system utilizing a sump.</p> <p><b>F</b> Designs a vertical combination waste and vent system.</p>

Hours	
Class	OJT

20.00	20.00
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**25 WATER SUPPLY PIPING**

- A Describes and understands the history of indoor plumbing systems.
- B Understands the concepts of density and viscosity as they apply to water supply piping.
- C Understands the factors which cause resistance to the flow of water in supply piping.
- D Explains the concepts of density and viscosity.
- E Explains the factors which influence resistance in water supply piping.
- F Understands the effects of pipe sizes on reducing friction within a water supply system.
- G Understands the effects of valves, fittings, and pipe on water pressure.
- H Understands and uses procedures for calculating pressure in water supply piping.
- I Describes the effects of altering pipe sizes in water supply piping.
- J Calculates pressure drops in water supply piping.
- K Understands the procedure for calculating the pressure drop due to friction in water supply piping.
- L Explains and understands the procedure for sizing water supply piping.
- M Lays out a plumbing system in a structure.
- N Explains, understands and sizes a continuous flow piping systems.
- O Understands and explains the water and energy savings possible with flow restrictors.

15.00	15.00
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**26 CORROSIVE RESISTANT WASTE PIPING**

- A Discusses and understands corrosive wastes and explains how they are formed.
- B Discusses and uses types of material used for corrosive resistant waste piping.
- C Discusses and explains the two types of plastics used in corrosive waste systems.
- D Discusses the characteristics of borosilicate glass piping.
- E Explains the various methods used for joining acid resistant plastic and glass pipe.
- F Discusses the characteristics and joining methods for silicon cast iron pipe.

10.00	10.00
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**27 MOBILE HOMES AND MOBILE HOME PARKS**

- A Understands the location and layout of mobile homes and mobile home parks.
- B Understands the types of supply systems used in mobile home parks.
- C Understands the sanitary sewer requirements for mobile home parks.
- D Understands how to make connections for water and sewer lines to mobile homes.
- E Understands what a sanitary dump station is.

**TOTAL HOURS**

Class	OJT	Course
360.00	360.00	720.00