# Scope & Sequence

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| Course Name: Plumbing Technology II **TSDS PEIMS Code:** 13006100 | **Course Credit:** 2.0**Course Requirements:** Grade Placement 11-12. **Prerequisites:** Plumbing Technology I. |
| **Course Description:** In Plumbing Technology II, students will gain the advanced knowledge and skills needed to enter the industry as a plumber, building maintenance technician, or supervisor or prepare for a postsecondary degree in mechanical engineering. Students will acquire knowledge and skills in plumbing codes, industry workplace basics, and employer/customer expectations, including tool and jobsite safety, advanced plumbing mathematics, commercial drawings, basic electricity, hanger installation, supports and structural penetrations, roof drains, fixture installation, valves and faucets, and oxy-fuel safety. Students will also learn about setup, cutting, brazing and welding water system sizing; gas, drain, waste and vent installation and testing; and water heater installation.  |
| **NOTE:** This is a suggested scope and sequence for the course content. This content will work with any textbook or instructional materials. If locally adapted, make sure all TEKS are covered. |
| **Total Number of Periods****Total Number of Minutes****Total Number of Hours** | 350 Periods.15,750 Minutes.262.5 Hours.\* | \*Schedule calculations based on 175/180 calendar days. For 0.5 credit courses, schedule is calculated out of 88/90 days. Scope and sequence allows additional time for guest speakers, student presentations, field trips, remediation, extended learning activities, etc. |
| **Unit Number, Title, and Brief Description** | **# of Class Periods\***(assumes 45-minute periods)Total minutes per unit | **TEKS Covered****130.62 (c) Knowledge and skills** |
| **Unit 1: Professional Standards and Employability Skills**Students will continue to identify employment and entrepreneurship opportunities in the field of plumbing. Students will be encouraged to discover and use resources to further develop leadership and employability skills. Students will demonstrate appropriate and effective group participation, leadership, teamwork, and good citizenship in this and in all units as they develop personal and career goals and increase their interpersonal skills. Students will examine and discuss industry certification opportunities. | 20 periods900 minutes | (1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:(A) use industry standards to demonstrate oral communication, written communication, leadership, teamwork, conflict management, customer service, professionalism, work ethic, integrity, multitasking, initiative, creativity, and how to follow directions;(B) demonstrate an understanding of the importance of showing up to work on time, maintaining appropriate personal appearance, working as a team member, and being honest;(C) demonstrate an understanding of the responsibilities of driving a company vehicle;(D) demonstrate an understanding of why and how listening is a critical skill; and(E) demonstrate an understanding of the importance of being a self-starter and of increasing one's knowledge and skills in a chosen career field.(5) The student reviews employer and customer expectations. The student is expected to:(A) identify job opportunities such as a plumber, building maintenance technician or supervisor, manager, and mechanical engineer and their accompanying job duties;(B) research careers along with the education, job skills, and experience required to achieve career goals;(C) identify the industries and associations that make up the modern plumbing profession;(D) demonstrate an understanding of how to properly treat company and customer property; (F) demonstrate an understanding of the importance of using proper methods and techniques for the job being performed. |
| **Unit 2: Health and Safety** Students will discuss, describe, and demonstrate employers’ expectations regarding safe and appropriate work habits, and legal requirements in the workplace. Students will participate as a class and/or in small groups in activities to model, present, and demonstrate health and safety. Students will have multiple opportunities for students to learn and demonstrate their knowledge of personal responsibility, the function, application, and safe use of tools and equipment, and the proper handling and disposal of environmentally hazardous materials.  | 25 periods1,125 minutes | 5) The student reviews employer and customer expectations. The student is expected to: (E) demonstrate an understanding of the importance of keeping the work area clean and how that applies to job safety; and(10) The student understands and applies how to braze weld and cut with oxy-fuel torch. The student is expected to:(D) demonstrate an understanding of safety and safety equipment used with oxy-fuel equipment. (12) The student understands what cross connections are and their degree of hazard and how to protect against them. The student is expected to:(A) identify different types of backflow such as gravity, back-pressure, and back siphonage;(B) demonstrate an understanding of degree of hazard such as toxic, nontoxic, polluted, and contaminated; and(C) demonstrate an understanding of cross connection protection such as air gap, reduced pressure zone backflow preventer, double check valve assembly, pressure type vacuum breaker, and atmospheric type vacuum breaker. |
| **Unit 3: Proper Use and Care of Tools and Equipment**Students will continue to demonstrate the safe use of tools and equipment used on plumbing projects. Students may be introduced to new tools and expected to select the appropriate tool for the job, properly care of the tools and equipment, and describe the safety requirements as related to each plumbing tasks.  | 25 periods1,125 minutes | (2) The student identifies and demonstrates the use of hand and power tools such as pipe wrenches; rulers; measuring devices; drill bits; pipe stands; pipe vises; levels; pipe fabrication tools; and pipe cutting, threading, and reaming tools. The student is expected to:(A) demonstrate how to measure with a 6-foot folding rule and 25-foot measuring tape;(B) read and use rulers and measuring devices;(C) demonstrate how to measure end-to-end, center-to-center, and end-to-center pipe measurements; and(D) identify and safely demonstrate the use of selected hand and power tools.(3) The student understands different types of drill bits used in the plumbing profession. The student is expected to:(A) explain the differences among and applications for masonry, twist steel, hole saw, paddle, and self-feeding wood bits; and(B) demonstrate the use and application of masonry, twist steel, hole saw, paddle, and self- feeding wood bits.(10) The student understands and applies how to braze weld and cut with oxy-fuel torch. The student is expected to:(A) demonstrate an understanding of different parts of oxy-fuel equipment;(B) identify and implement the proper procedure for attaching and adjusting oxy fuel pressure regulators, gauges, hoses, and torches to oxy fuel bottles;(C) identify and apply fillers and fluxes for soldering and brazing;  |
| **Unit 4: Math Concepts and Applications**Students will apply algebra and geometry such calculating the volume grade, pressure, and velocity in specific plumbing tasks. Students will be given multiple opportunities to describe, demonstrate and apply relevant problem-solving, reading, writing, and mathematical skills in-context as they read and interpret installation and repair information, technical bulletins, specifications, schematics, and parts catalogs.  | 25 periods1,125 minutes | (4) The student applies algebra and geometry to solve plumbing-related problems. The student is expected to:(A) demonstrate how to determine the volume of a cylinder;(B) demonstrate how to determine volume and length measurements using cubic feet and yards;(C) demonstrate how to determine fall and grades of a pipe;(D) demonstrate how to calculate simple and rolling offsets on parallel runs using constants;(E) demonstrate how to calculate pressure, velocity, friction, and flow; and(F) size a water system based on velocity limitations and pressure drop. |
| **Unit 5: Plumbing Drawings** Students will continue to expand their understanding of plot plans, shop drawings, elevation drawings, etc. Students will use drawing symbols and create sketches. Students will continue to learn and demonstrate their knowledge of plumbing drawings in-context with their “hands on” activities.  | 20 periods900 minutes | (8) The student learns plot plans, structural design, shop drawings, elevation drawings, as-built drawings, equipment arrangement drawings, pipe and instrumentation drawings, isometric drawings, and detail drawings. The student is expected to:(A) identify types of drawings;(B) identify and use drawing symbols associated with piping plans and details;(C) create field sketches; and(D) interpret drawing indexes and line lists.  |
| **Unit 6: Electrical** Students will develop an understanding of basic electrical equipment and procedures. Students will utilize volt/ohm meters, hangers and supports to meet code standards. Students will reinforce their knowledge through class discussions, lab activities and ongoing projects. | 40 periods1,800 minutes | (6) The student understands and applies electrical testing equipment. The student is expected to:(A) apply the use of a volt/ohm meter to different kinds of plumbing equipment;(B) install hangers and supports and make penetrations according to plumbing code;(C) demonstrate an understanding of how to choose the right hanger for the application;(D) choose and build pipe supports;(E) demonstrate an understanding of code standards on structural penetrations; and(F) size and install roof drains according to plumbing code. |
| **Unit 7: Valves**Students will continue to be given multiple opportunities through classroom discussions and “hands on” activities to expand their knowledge of the various types of valves and their uses. Students will be able to select the appropriate valve for specific plumbing activities.   | 20 periods900 minutes | (9) The student installs, stores, and handles various types of valves. The student is expected to:(A) identify types of valves that start and stop flow;(B) identify types of valves that regulate flow;(C) identify valves that relieve pressure;(D) identify valves that regulate the direction of flow;(E) identify types of valve actuators;(F) explain how to properly store and handle valves;(G) explain valve locations and positions;(H) explain the factors that influence valve selection; and(I) interpret valve markings and nameplate information. |
| **Unit 8: Install Fixtures and Faucets**Students will follow directions and codes in installation of plumbing fixtures. Students will demonstrate proper procedures and techniques through “hands on” activities and/or plumbing projects.  | 25 periods1,125 minutes | (7) The student understands and applies how to install plumbing fixtures according to plumbing code. The student is expected to:(A) demonstrate how to install a toilet; and(B) demonstrate how to install sinks and different faucets. |
| **Unit 9: Drain, Waste and Vent Systems**Students will expand their knowledge and enhance their demonstration with Drain, Waste and Vent Systems (DWV) Students will have opportunities to select the appropriate type of trap for a specific situation. Students will expand their knowledge of drain, waste and vent system through multiple opportunities for “hands-on” presentations, discussions, and demonstrations.   | 35 periods1,575 minutes | (14) The student understands how to size, install, and test a drain waste and vent (DWV) system according to plumbing code. The student is expected to:(A) identify different types of DWV fittings and their use;(B) size a DWV system;(C) identify and apply different materials used for a DWV system;(D) determine slope of a pipe using formulas;(E) demonstrate an understanding of how to test a DWV system; and(F) demonstrate an understanding of the different parts and their purpose of a DWV system such as stacks, vents, traps, building drain, and building sewer.  |
| **Unit 10: Water Piping System**Students will apply math concepts in determining the size of a residential water system. Students will follow plumbing procedures to install and test a system that meets plumbing code. Students will enhance their knowledge and application through classroom discussions, “hands on” activities and plumbing projects. | 40 periods1,800 minutes | 11) The student understands and applies how to size, install, and test a residential water piping system according to plumbing code. The student is expected to:(A) identify what factors are critical for sizing a water system such as water pressure, velocity, friction, and flow;(B) identify what fixture units are and how they apply to sizing a water system;(C) install a water piping system; and(D) test a water piping system. |
| **Unit 11: Natural Gas**Students will develop an understanding of the natural gas system. Students will utilize appropriate procedures to size, install and test a natural gas system according to plumbing code. Students will reinforce their knowledge through class discussions, lab activities and ongoing projects. | 35 periods1,575 minutes | (13) The student understands and applies how to size, install, and test a natural gas system according to plumbing code. The student is expected to:(A) identify the factors involved in sizing a natural gas system; and(B) size, install, and test a natural gas system using carbon steel pipe and corrugated stainless steel tubing. |
| **Unit 12: Water Heaters**Students will learn and demonstrate technical knowledge concerning solar, gas, and electric water heaters. Students will continue to learn and use the appropriate terminology as well as standard practices and procedures through classroom discussions, lab activities, and plumbing projects. | 40 periods1,800 minutes | (15) The student understands different types of water heaters, water heaters parts, and their proper installation according to plumbing code. The student is expected to:(A) demonstrate an understanding of storage tank (electric and gas), point of use, on demand (electric and gas), and solar water heaters;(B) demonstrate an understanding of parts of the different heaters; and(C) demonstrate an understanding of the installation of a gas and electric water heater. |