Curriculum Framework for Hydro-Technology

CIP Code: 46.0503

Initial Review Date: 11/01/2018 (08/28/2025)

Eligibility Dates: 11/01/2018 through 11/01/2030

Credit Award: 20 Credits

Course Equivalencies:

Hydro-Technology Program	Credits	TESU Course Equivalent	Effective Dates	For Staff Use
Hydro-Technology Program	4	MAI-1310	11/1/2008-11/1/2030	CCTS.HYDR
Hydro-Technology Program	4	MAI-1320	11/1/2008-11/1/2030	CCTS.HYDR
Hydro-Technology Program	3	MAT-1999	11/1/2008-11/1/2030	CCTS.HYDR
Hydro-Technology Program	3	TEC-1420	11/1/2008-11/1/2030	CCTS.HYDR
Hydro-Technology Program	3	COD-1320	11/1/2008-11/1/2030	CCTS.HYDR
Hydro-Technology Program	2	LAW-2010	11/1/2008-11/1/2030	CCTS.HYDR
Hydro-Technology Program	1	APS-2100	11/1/2008-11/1/2030	CCTS.HYDR

Gaining Access to the Evaluated Credit Award

The following curriculum was evaluated by Thomas Edison State University (TESU) through its Professional Learning Review (PLR) Process to determine college-credit equivalency for the training program.

The current state approved Career and Technical Education (CTE) programs in New Jersey that have been verified to follow this curriculum, and to be eligible to receive TESU credit upon completion can be found on the Verification Letter.

Question: How does your CTE program become eligible for this credit award for your students?

Answer: To become eligible, and to have your school's name listed on the Verification Letter, please follow these instructions:

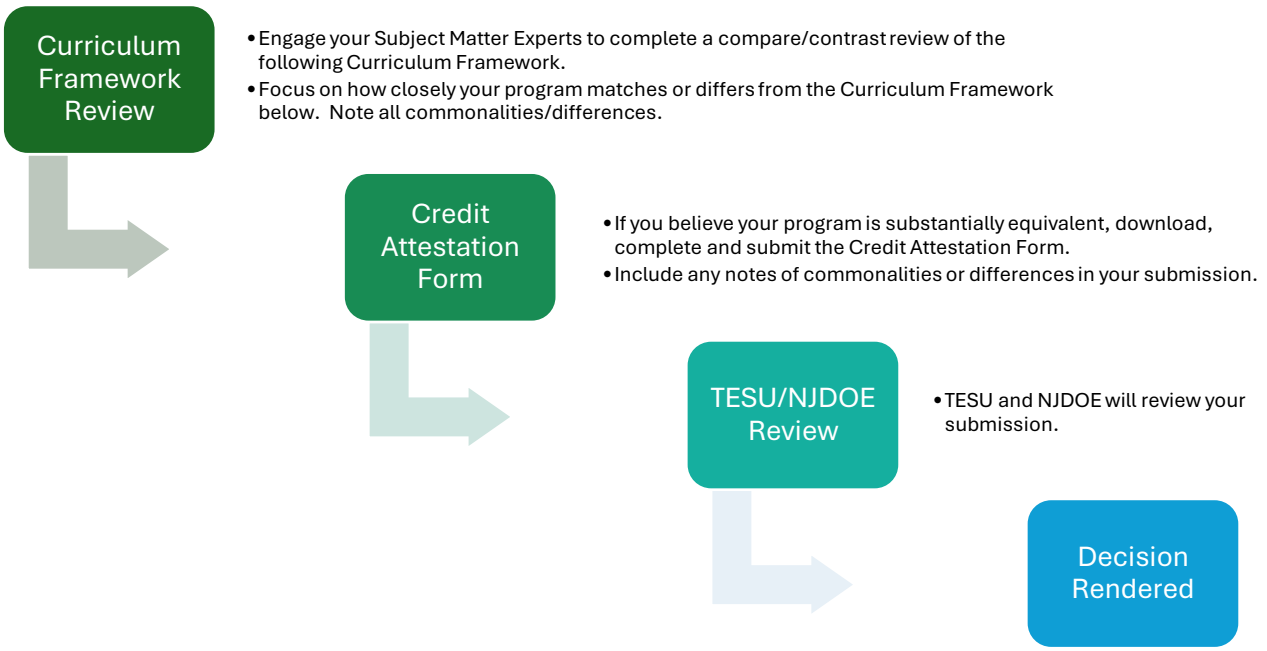
Step 1. Review the following Curriculum Framework and compare it against your school's current state approved CTE program. TESU suggests utilizing your school's subject matter experts for this compare/contrast review. The GOAL of your review is to ensure that the training program in place at your school matches the evaluated program.

Step 2. Complete/Download the Credit Attestation Form for this program on TESU's website.

Step 3. Complete the Credit Attestation Form and email it to plr@tesu.edu.

Step 4. TESU will review the contents and share the attestation form information with the New Jersey Department of Education (NJDOE) for approval.

Step 5. Once approved by TESU and the NJDOE, you will be notified, and an updated Verification Letter will be added to the TESU website for this program.



If you have any questions, or if your compare/contrast review is close but off a little, please contact us at plr@tesu.edu.

Curriculum Framework

Approved Program Name: Hydro-Technology Program

CIP Code: 46.0503

Length of Program: 4 Years / 1600 Hours

Credit Award: 20 Credits

Course Equivalencies:

Hydro-Technology Program	Credits	TESU Course Equivalent	Effective Dates	For Staff Use
Hydro-Technology Program	4	MAI-1310	11/1/2008-11/1/2030	CCTS.HYDR
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Hydro-Technology I

The review team found that the Hydro-Technology I curriculum establishes a substantial foundation in both theoretical and applied aspects of the plumbing trade. Instruction introduces essential safety practices, code awareness, and tool operation, while also providing students with the building blocks necessary for future advancement. The curriculum is scaffolded and structured with measurable outcomes, comparable in scope and depth to introductory college-level coursework.

Key areas of focus include:

- Plumbing terminology, lexicon, and code awareness (National Standard Plumbing Code, NJ edition)
- Fitting and material identification across multiple piping systems (potable water, DWV, gas, compressed air, and specialized use)
- Accurate pipe measurement, calculation of angles, and pipe sizing
- Safe and proper operation of plumbing-specific tools
- Introduction to blueprint interpretation and technical drawing
- Health and safety standards, reinforced through OSHA-10 training

Students also cut, assemble, and join various piping materials, including PVC, copper, steel, CSST, PEX, cast iron, and ABS. These experiences establish the technical and safety foundation expected of lower-division college coursework.

Hydro-Technology II

The review team concluded that Hydro-Technology II builds meaningfully upon the competencies acquired in Hydro-Technology I, advancing into more technical and applied domains. Instructional design demonstrates strong sequencing, with measurable outcomes aligned to mid-level college coursework.

Core areas of instruction include:

- Gas piping riser diagrams and load calculations
- Steel pipe threading (manual and power) with fitting allowances and measurement accuracy
- Advanced plumbing math: volume calculations, water pressure and height relationships, laminar flow, and hydraulics
- Waste, venting, and drainage system design using DFU calculations and code-based sizing
- Trap design, prohibited traps, and system layout applications
- Stormwater design: roof, floor, and area drains sized using rainfall data
- Application of the 22 Basic Principles of Plumbing
- Penetrations, insulation, and fire-stopping in residential and commercial systems

Students also engage in blueprint drawing and technical drafting and are introduced to the fundamentals of electricity (Ohm’s Law, electrical safety, wire sizing), directly applied to plumbing-related contexts. A new building project from slab through rough-in and final inspection requires system design, layout, testing, and code compliance. This integrative “capstone” mirrors the rigor of 2000-level applied technology coursework.

Hydro-Technology III

The review team found that Hydro-Technology III reflects a continued progression into advanced technical competencies and higher-order problem solving. The course demonstrates curricular coherence and depth, with instructional methods designed to move students from theoretical understanding to applied expertise.

Instruction emphasizes:

- Advanced water supply systems, including backflow prevention, water distribution design, and pressure regulation
- Hot water system installation and troubleshooting (including water heater installation and venting per Fuel Gas Code)
- Complex drainage and venting applications in multi-story structures
- Specialized piping systems (compressed air, medical gas, hydronic heating)
- Expanded blueprint reading and technical drafting, including isometric drawings and system schematics
- Applied regulatory compliance with plumbing codes and standards in commercial and industrial contexts
- Business and project management concepts, including estimating, contracts, scheduling, and legal considerations

This stage integrates technical mastery with regulatory and business literacy, reinforcing the associate-level expectation of blending theory, practice, and project management.

Hydro-Technology IV

The review team determined that Hydro-Technology IV provides a comprehensive culmination of the program, requiring students to integrate and demonstrate mastery of all prior learning in both classroom and applied settings. The curriculum emphasizes synthesis of technical, regulatory, and professional competencies, reflecting the rigor and scope of advanced associate-level coursework.

By the end of Hydro-Technology IV, students are expected to:

- Design, install, and test full-scale plumbing systems in residential and commercial projects
- Demonstrate advanced troubleshooting and diagnostic skills across water supply, drainage, gas, and stormwater systems
- Apply complex DFU and load calculations to multi-system layouts
- Integrate plumbing design with related trades (mechanical, electrical, structural)
- Interpret, apply, and comply with plumbing codes at an advanced level
- Manage projects from blueprint interpretation through installation, inspection, and closeout

Capstone projects mirror real-world professional practice, requiring blueprint reading, system design, layout, installation, inspection, and project management. This culminating experience ensures students graduate with the comprehensive technical, safety, and professional skills necessary for immediate employment or continued study in construction and applied technology programs.

OSHA-10

All Hydro-Technology Program students complete OSHA-10 training. Students who complete OSHA-10 are eligible to receive 1 credit in APS-2100 through a previously conducted Professional Learning Review at Thomas Edison State University. This is included in the credit recommendations.

Program Exhibit

Course Title: Hydro-Technology Program

Modality/Location(s): In-Person

CIP Code: 46.0503

Length: 4 years, 1600 hours

Description: This program introduces students to all facets of the plumbing trade and will provide the basic skills needed for entry-level employment. Students will learn methods of installation, repair, and plumbing maintenance. Theory-based instruction includes basic trade competencies, trade mathematics, introduction to blueprint reading and drawing, as well as the National Standard Plumbing Code. Hands on instruction will be given to the students participating in the actual layout, installation, and repair of plumbing systems, fixtures, and appliances. The tools, materials, and supervised projects assigned in class simulate actual conditions in the domestic and commercial plumbing industries.

Learning Outcomes:

Hydro-Technology – Level I

Safety I

- Understand employee safety responsibilities
- Understand safety concepts related to using Personal Protective Equipment, tools, equipment, electrical and trench safety, ladders, aerial lifts, scaffolds, material handling, motor vehicles, confined spaces, hazardous materials, soldering and brazing, fire extinguishers, and incident reports.
- Practice job safety at all times and wear appropriate personal protective equipment.
- Adhere to a substance abuse policy that maintains a safe working environment and promotes high work standards.
- Demonstrate three-step proper lifting technique.
- Safely maintain and use a variety of hand and power tools.
- Learn and adhere to OSHA regulations to minimize the hazards associated with electrical tools and equipment.
- Maintain trench safety including failures, shoring, shielding, and precautions.
- Recognize uses of various types of ladders, regulations, demonstrate climbing techniques, and maintenance.
- Recognize and safely use three types of aerial lifts.
- Diagram and erect mobile and freestanding scaffolds.
- Safely rig, lift, and transport materials by mechanical means.
- Practice motor vehicle safety.
- Enter and perform work in a confined space, recognize entrapment hazards and unsafe conditions, and complete a confined space entry permit.
- Recognize hazardous materials labeling utilizing the NFPA hazard signal system.
- Perform soldering and brazing operations safely.
- Use proper fire protection equipment and recognize fire extinguisher symbols.
- Properly complete a sample incident report.

Plumbing Basics and Tasks

- Draw a timeline depicting the history of plumbing.
- Differentiate between the various levels of plumbing trade experience and expertise including apprentice, journeyman, foreman (supervisor), general foreman, and piping superintendent.
- Comprehend what encompasses the standards required by the U.S. Department of Labor for the level of Apprentice Plumber.
- Use the resources of Plumbing Industry and Standards Organizations' resources to ensure product safety, quality, and efficiency.
- Use plumbing codes used today including Uniform Plumbing Code, International Plumbing Code, and the National Standard Plumbing Code.
- Read and understand prints and specifications.
- Diagram the three basic plumbing systems utilized by a plumber to supply water to a building and remove the wastewater and waterborne waste material: the potable water supply system, the sanitary drainage and vent piping system, and the storm water drainage system.

Read/Interpret/Calculate Blueprints

- Plans and Specifications interpretation and sketching and preparation of specifications
- Use of Dimensions, symbols, metric dimensions and scales needs
- Sketching and piping installation

Perform Plumbing Systems Rough-in

- Identify the steps involved in bringing water and sewer service into a building.
- Describe the proper procedures for locating the DWV and water supply piping.
- Plan all modifications that must be made to the structure so the plumbing system can be installed.

Hydro-Technology - Level II

Safety II

- See Level I

Intermediate Plumbing Tasks

- Identify the solders, brazing filler materials, and fluxes needed for successfully soldering and brazing copper pipe and fittings
- Describe and demonstrate the processes for soldering and brazing copper pipe
- Describe the process for welding plastic pipe and fittings
- Explain the importance of locating and protecting existing underground utilities
- Describe how excavating tools and machines are used to install plumbing systems
- Develop a list of safety rules regarding the use of excavating machines and tools
- Describe shoring methods and explain how shoring is used to protect workers in a trench

Perform Systems Rough-in

- Describe proper procedures for locating and installing DWV piping systems
- Use the prescribed techniques for working with plastic, copper, galvanized iron, black iron, and cast-iron DWV materials
- Compare and use the three methods of measuring pipe length between fittings
- Describe or demonstrate methods for testing and inspecting completed DWV systems

Install Fixtures, Appliances and Appurtenances

- Lavatory and Sink Installation, including:
    - Preparing openings in countertops
    - Mounting faucets.
    - Installing Water Supply and DWV Adapter Fittings
    - Hanging Ledge-type Sinks
    - Placing the Lavatory or sink in Position
    - Installing Drainage Fittings
    - Connecting Faucets
- Completing Bathtub and Shower Installations, including:
    - Tub Drain, Overflow and Stopper Assembly
    - Tub/Shower Valve Installation
    - Showerhead/handheld Shower Installation
    - Tub Spout
    - Leaks Check
- Installation of Whirlpool Tubs
- Water Closet Installation
    - Prepare Stub-out
    - Connect DWV Piping
    - Install the Bowl
    - Install the Tank
    - Check for Leaks
    - Connect Water Supply
    - Adjust Water Level
    - Other Varied Installations

Hydro-Technology - Level III

Safety III

- See Level I

Advanced Plumbing Tasks

- Identify and describe the basic components of swimming pools, hot tubs, and spas.
- Describe design considerations important to the construction of swimming pools, hot tubs, and spas.
- Explain the installation of swimming pools, hot tubs, and spas.
- List the basic considerations for satisfactory operation of sprinkler irrigation systems.
- Explain the importance of water pressure in the operation of sprinkler heads.
- List the factors that can cause pressure loss.
- Name and describe the operation of three principle types of sprinkler heads.
- Describe the processes of designing, laying out, and installing lawn or gardening sprinkler systems.

Plumbing Systems Service Repairs

- Recognize DWV system problems using the troubleshooting guide
- Describe an orderly method of checking and testing a plumbing system to confirm an actual problem
- Demonstrate or explain procedures for making the proper repair when a problem is located
- Recognize water supply problems by analyzing symptoms

Regulatory and Career Considerations

- Describe how to become familiar with a new plumbing job.
- Identify the materials, supplies, tools, and equipment necessary to complete a plumbing job.
- Describe the importance of teamwork to successful completion of a job.
- Make better use of time.
- Describe how to coordinate plumbing with the work of other trades.
- Explain the different guidelines for proper safety and procedures when working on a jobsite.

Hydro-Technology – Level IV

Safety IV

- See Level I

Sustainable Plumbing

- Water conservation
- Water reclamation and recycling
- Low-flow plumbing fixtures and appliances
- High-efficiency fixture and appliance programs
- High-efficiency water systems
- Insulation
- Green building

Regulatory and Career Considerations

- Identify five major areas that are sources of plumbing jobs.
- Explain the three different levels of the plumbing apprenticeship program.
- List and explain qualifications for success in the plumbing trade.
- List and explain the basic educational requirements for entry into a plumbing apprenticeship.
- Compare and contrast the guidelines for proper safety and procedures when working on a jobsite.

Employability

- intake/out take data
- EOP survey
- portfolio artifact collection
- interview skills
- program completer's career services support
- Career Assistance Navigator (NJCAN) employability skills assessment
- Job Ready Career Skills (computer-based modules)
- Address work habits, workplace effectiveness, business etiquette, communication skills, and job searches.

End of Curriculum Framework

Suggested Degree Programs at TESU

- Associate of Applied Science (AAS) in Construction and Facilities Support
- Associate of Science (A.S.) in Technical Studies
- Bachelor of Science (B.S.) in Construction
- Bachelor of Science (B.S.) in Technical Studies

For more information, please contact Thomas Edison State University's Professional Learning Review Office via email at plr@tesu.edu.