

HVAC: Level One

03101-07 Introduction to HVAC (7.5 Hours)

Covers the basic principles of heating, ventilating, and air conditioning, career opportunities in HVAC, and apprenticeship programs.

03102-07 Trade Mathematics (10 Hours)

Explains how to solve problems involving the measurement of lines, area, volume, weights, angles, pressure, vacuum, and temperature. Also introduces scientific notation, powers, roots, and basic algebra and geometry.

03103-07 Copper and Plastic Piping Practices (5 Hours)

Covers the selection, preparation, joining, and support of copper, plastic piping, and fittings

03104-07 Soldering and Brazing (7.5 Hours)

Covers tools, materials, and safety precautions and depicts step-by-step procedures for soldering and brazing piping.

03105-07 Ferrous Metal Piping Practices (5 Hours)

Covers various types of iron and steel pipe and fittings, and provides step-by-step instructions for cutting, threading, and joining ferrous piping.

03106-07 Basic Electricity (12.5 Hours)

Teaches power generation and distribution, electrical components, DC circuits, and electrical safety.

03107-07 Introduction to Cooling (30 Hours)

Covers the basic principles of heat transfer, refrigeration, and pressure-temperature relationships, and describes the components and accessories used in air conditioning systems.

03108-07 Introduction to Heating (15 Hours)

Covers heating fundamentals, types and designs of furnaces and their components, and basic procedures for installing and servicing furnaces.

03109-07 Air Distribution Systems (10 Hours)

Describes air distribution systems and their components, air flow measurement, ductwork installation principles, and the use of instruments for measuring temperature, humidity, pressure, and velocity.

HVAC: Level Two

03201-07 Commercial Airside Systems (12.5 Hours)

Describes the systems, equipment, and operating sequences used in a variety of commercial airside configurations, such as a constant volume single-zone and multi-zone, VVT, VAV, and dual-duct VAV.

03202-07 Chimneys, Vents, and Flues (5 Hours)

Covers the principles of venting fossil-fuel furnaces and the proper methods for selecting and installing vent systems for gas-fired heating equipment.

03203-07 Introduction to Hydronic Systems (10 Hours)

Introduces hot water heating systems, focusing on safe operation of the low-pressure boilers and piping systems commonly used in residential applications.

03204-07 Air Quality Equipment (5 Hours)

Covers the basic principles, processes, and devices used to control humidity and air clean-lines, as well as devices used to conserve energy in HVAC systems.

03205-07 Leak Detection, Evacuation, Recovery, and Charging (20 Hours)

Covers the basic refrigerant handling and equipment servicing procedures to service HVAC systems in an environmentally safe manner.

03206-07 Alternating Current (7.5 Hours)

Covers transformers, single-phase and three-phase power distribution, capacitors, the theory and operation of induction motors, and the instruments and techniques used in testing AC circuits and components. Also reviews electrical safety.

03207-07 Basic Electronics (5 Hours)

Explains the theory of solid-state electronics, as well as the operation, use, and testing of the various electronic components used in HVAC equipment. Includes an introduction to computers.

03208-07 Introduction to Control Circuit Troubleshooting (30 Hours)

Covers the operation, testing, and adjustment of conventional and electronic thermostats, as well as the operation of common electrical, electronic, and pneumatic circuits used to control HVAC systems. Also explains how to analyze circuit diagrams for electronic and microprocessor-based controls used in comfort heating and cooling equipment and how to troubleshoot systems that use these controls.

03209-07 Troubleshooting Gas Heating (12.5 Hours)

Covers tools, instruments, and techniques used in troubleshooting gas heating appliances, including how to isolate and correct faults.

03210-07 Troubleshooting Cooling (20 Hours)

Covers the basic techniques and equipment used in troubleshooting cooling equipment, focusing on analyzing system temperatures and pressures in order to isolate faults.

03211-07 Heat Pumps (20 Hours)

Covers the principles of reverse cycle heating, describes the operation of the various types of heat pumps, and describes how to analyze heat pump control circuits. Includes heat pump installation and service procedures.

03212-07 Basic Installation and Maintenance Practices (17.5 Hours)

Covers the application and installation of various types of fasteners, gaskets, seals, and lubricants, as well as the installation and adjustment of different types of belt drives, bearings, and couplings. Includes job documentation and customers relations.

03213-07 Sheet Metal Duct Systems (5 Hours)

Covers layout, fabrication, installation, and insulating sheet metal ductwork. Also includes selection and installation of registers, diffusers, dampers, and other duct accessories.

HVAC: Level Two (cont.)

03214-07 Fiberglass and Flexible Duct Systems (5 Hours)

Covers the layout, fabrication, installation, and joining of fiberglass ductwork and fittings. Describes the proper methods for attaching and supporting flex duct.

HVAC: Level Three

03301-08 Refrigerants and Oils (10 Hours)

Covers characteristics and applications of the current generation of refrigerants, including both pure and blended refrigerants. Also provides extensive coverage of lubricating oils used in refrigeration systems.

03302-08 Compressors (15 Hours)

Explains the operating principles of the different types of compressors used in comfort air conditioning and refrigeration systems, along with basic installation, service, and repair procedures for these components.

03303-08 Metering Devices (7.5 Hours)

Covers the operating principles, applications, installation, and adjustment of the various types of fixed and adjustable expansion devices used in air conditioning equipment.

03304-08 Retail Refrigeration Systems (20 Hours)

Introduces the product refrigeration components and systems, such as the reach-in coolers and freezers commonly used in markets.

03305-08 Commercial Hydronic Systems (12.5 Hours)

Covers the various types of boilers, components, and piping systems used in commercial heating applications. Also introduces chilled water systems and their components.

03306-08 Steam Systems (10 Hours)

Covers operating principles, piping systems, components, and preventive maintenance requirements of steam systems and steam traps.

03307-08 Planned Maintenance (20 Hours)

Describes the purpose of planned maintenance and outlines the procedures for servicing gas and oil furnaces, electric heating equipment, cooling equipment, and heat pumps.

03308-08 Water Treatment (10 Hours)

Covers the kinds of water problems encountered in heating and cooling systems and identifies various water treatment methods and equipment.

03309-08 Troubleshooting Electronic Controls (7.5 Hours)

Explains how to analyze circuit diagrams for electronic and microprocessor-based controls used in comfort heating and cooling equipment and how to troubleshoot systems that use these controls.

03310-08 Troubleshooting Oil Heating (10 Hours)

Covers how to identify the common causes of problems in oil furnaces and offers hands-on experience in isolating and correcting oil furnace malfunctions.

03311-08 Troubleshooting Heat Pumps (12.5 Hours)

Reviews heat pump orientation and heat pumps control circuits, including how to isolate and correct faults in the heating, cooling, auxiliary heat, and defrost functions of heat pumps.

03312-08 Troubleshooting Accessories (10 Hours)

Provides hands-on lab sessions on how to troubleshoot humidifiers, electronic air cleaners, economizers, zone controls, and heat recovery ventilators.

HVAC: Level Four

03401-09 Construction Drawings and Specifications (25 Hours)

Covers how to interpret the various drawings used in commercial construction, including mechanical drawings, specifications, shop drawings, and as-builts and to perform takeoff procedures for equipment, fittings, ductwork and other components.

03402-09 System Balancing (20 Hours)

Covers air properties and gas laws, as well as the use of psychrometric charts. It covers the tools, instruments, and methods used in balancing an air distribution system.

03403-09 Indoor Air Quality (15 Hours)

Defines the issues associated with indoor air quality and its affect on the health and comfort of building occupants. Provides guidelines for performing an IAQ survey and covers the equipment and methods used to monitor and control indoor air quality.

03404-09 Energy Conservation Equipment (10 Hours)

Covers the various heat recovery/reclaim devices, along with other energy recovery equipment used to reduce energy consumption in HVAC systems.

03405-09 Building Management Systems (17.5 Hours)

Explains how computers and microprocessors are used to manage zoned HVAC systems. This module has been updated to reflect new system architecture, advances in network protocols and systems controllers, and communication via the Internet and wireless.

03406-09 System Startup and Shutdown (22.5 Hours)

Covers procedures for the start-up of hot water, steam heating, chilled water, and forced-air distribution systems. Emphasis is on start-up after initial equipment installation or after an extended period of shut-down. Includes procedures for preparing these systems for extended shutdown.

03407-09 Heating and Cooling System Design (25 Hours)

Identifies and explains the factors that affect heating and cooling loads, describes the process by which heating and cooling loads are calculated, and shows how load calculations are used in the selection of heating and cooling equipment. Covers types of duct systems and their selection, sizing, and installation requirements.

03408-09 Commercial and Industrial Refrigeration Systems (22.5 Hours)

This module expands the study of product and process refrigeration begun in Level 3. It deals with the type of systems used in cold storage and food processing facilities, as well as transportation refrigeration.

03409-09 Alternative Heating and Cooling Systems (10 Hours)

Covers the variety of alternative devices that are used to reduce energy consumption, including wood, coal, and pellet-fired systems, waste-oil heaters, geothermal heat pumps, solar heating, in-floor radiant heating, and direct-fired makeup units.

03410-09 Introduction to Supervisory Skills (15 Hours)

Describes the skills that must be learned for the craftsperson who plans to move into leadership roles. Introduces human resource criteria and concepts for the first time in the series.