



# HVACR Technician

## PROGRAM OUTLINE

### PROGRAM GOAL AND OUTCOMES

#### Program Goal

To prepare students for an entry-level career as an HVACR technician in the residential and light construction field

Program Outcomes	Courses	Evidence of Learning
Explain mathematical processes and use of formulas necessary for design, evaluation, and installation of HVACR systems	HVC020: Math and Electrical Basics for HVACR	Multiple-choice lesson exams
	HVC040: Refrigeration Systems	Multiple-choice lesson exams
	HVC060: Residential and Light Commercial HVACR Systems	Multiple-choice lesson exams
	HVC070: HVACR System Design and Installation	Multiple-choice lesson exams
	HVC080: Commercial Refrigeration Systems	Multiple-choice lesson exams
Identify composition and usage of HVACR materials, equipment, and tools required for installation and diagnostic tasks	HVC020: Math and Electrical Basics for HVACR	Multiple-choice lesson exams
	HVC030: Fundamentals HVACR	Multiple-choice lesson exams
	HVC040: Refrigeration Systems	Multiple-choice lesson exams
	HVC060: Residential and Light Commercial HVACR Systems	Multiple-choice lesson exams
	HVC070: HVACR System Design and Installation	Multiple-choice lesson exams
Recognize safety procedures and established regulations related to workplace and job requirements	HVC030: Fundamentals HVACR	Multiple-choice lesson exams
	HVC080: Commercial Refrigeration Systems	Multiple-choice lesson exams
Describe the refrigeration cycle, gas laws, and properties of refrigerants required for diagnostic and systems design	HVC030: Fundamentals HVACR	Multiple-choice lesson exams
	HVC040: Refrigeration Systems	Multiple-choice lesson exams
	HVC060: Residential and Light Commercial HVACR Systems	Multiple-choice lesson exams
Identify drawings, technical diagrams, and specification charts required for installation and repair of HVACR systems	HVC050: Electrical Systems	Multiple-choice lesson exams
	HVC070: HVACR System Design and Installation	Multiple-choice lesson exams

Define theories and processes for evaluating and installing electrical systems and controls	HVC050: Electrical Systems	Multiple-choice lesson exams
List procedures for installing, inspecting, testing, repairing, and maintaining HVACR systems	HVC060: Residential and Light Commercial HVACR Systems	Multiple-choice lesson exams
	HVC070: HVACR System Design and Installation	Multiple-choice lesson exams
	HVC080: Commercial Refrigeration Systems	Multiple-choice lesson exams
Recognize procedures for following government regulations regarding the conservation, recovery, and recycling of refrigerants	HVC040: Refrigeration Systems	Multiple-choice lesson exams
	HVC080: Commercial Refrigeration Systems	Multiple-choice lesson exams

# PROGRAM STRUCTURE

## HVC010: Orientation to HVACR

Lesson 1	Starting Your Program
Lesson 2	Introduction to HVACR

## HVC020: Math and Electrical Basics for HVACR

Lesson 3	Math for the Trades
Lesson 4	The Nature of Electricity

## HVC030: Fundamentals of HVACR

Lesson 5	Fundamentals of HVACR Technology
Lesson 6	HVACR Tools, Equipment, and Measurements
Lesson 7	HVACR Science
Textbook	<i>Fundamentals of HVACR</i>

## HVC040: Refrigeration Systems

Lesson 8	Refrigeration Cycle, Compressors, and Condensers
Lesson 9	System Components, Refrigerant Properties, and Safety
Lesson 10	Service Procedures, Piping, and EPA Regulations

## HVC050: Electrical Systems

Lesson 11	Electrical Safety, Fundamentals, and Measurements
Lesson 12	HVACR System Components, Diagrams, and Control Systems

## HVC060: Residential and Light Commercial HVACR Systems

Lesson 13	Properties of Air and Airflow Fundamentals
Lesson 14	Residential HVACR Systems
Lesson 15	Combustion, Gas, and Oil Heating Systems
Lesson 16	Electric Heating Systems and Heat Pumps

## HVC070: HVACR System Design and Installation

Lesson 17	Building Construction and HVACR System Design
Lesson 18	Duct Design and Zone Control Systems
Lesson 19	Commercial HVACR Systems, Part 1
Lesson 20	Commercial HVACR Systems, Part 2

## HVC080: Commercial Refrigeration Systems

Lesson 21	Commercial Refrigeration Systems
Lesson 22	HVACR Troubleshooting
Lesson 23	HVACR Installation, Maintenance, and Cleanup
Lesson 24	Lithium Bromide Absorption Systems

# COURSE DESCRIPTIONS AND OBJECTIVES

## Orientation to HVACR

In this course, you'll develop the necessary skills to ensure your success in the program. You'll learn how you can improve your study skills, so you're able to use a number of tools that will help you to be successful.

Then, you'll learn the basics of HVACR, including climate control, comfort control, and refrigeration.

By the end of this course, you'll be able to do the following:

- Identify skills needed to be a confident and independent online learner
- Analyze the various components used in indoor climate control, refrigeration, and indoor comfort-control systems

## Math and Electrical Basics for HVACR

In this course, you'll get a general overview of the math skills and electrical knowledge required for a career in HVACR. You'll learn basic electrical terms and concepts such as power, voltage, and current. You'll also learn the math needed to perform electrical measurements, calculations, and conversions.

By the end of this course, you'll be able to do the following:

- Describe the nature of electricity
- Summarize how to use basic math operations for trade professions

## Fundamentals of HVACR

The work of an HVACR (heating, ventilation, air conditioning, and refrigeration) technician covers many types of systems and requires a very broad range of technical skills. As you begin your studies in this field, it's important that you establish a solid foundation of knowledge. Your first step in achieving this goal is to recognize the tools, test equipment, and common materials used by HVACR technicians.

By the end of this course, you'll be able to do the following:

- Analyze the field of HVACR, the associated roles, and the importance of safety at the workplace
- Categorize the components of HVACR field and work
- Point out the scientific elements and laws associated with HVACR

## Refrigeration Systems

As you know, the work performed by heating, ventilation, air conditioning, and refrigeration (HVACR) technicians is very diverse and involves many different applications of the fundamental concepts you've studied. The work also includes a wide range of air conditioning and refrigeration systems. This part of your program explains how those systems work and describe the specifics of the major components as well as the not-so-major components, which are often referred to as "accessories" even though they're necessary to the proper operation of a system with a specific design.

Included in this course are discussions about the many kinds of components you'll encounter when servicing various types of refrigeration systems, and what makes one type better suited for an installation than another. You'll learn how to display good work practices, demonstrate care for the environment, and follow the law when handling refrigerants. Finally, this course discusses system servicing, evacuation, and charging.

By the end of this course, you'll be able to do the following:

- Categorize the different types of refrigeration systems and their parts
- Distinguish between refrigeration devices, components, refrigerant properties, and the safety measures associated with each
- Describe the servicing, testing, and maintaining procedures for refrigerant systems

## Electrical Systems

The ability to troubleshoot heating, ventilation, air conditioning, and refrigeration (HVACR) equipment electrical problems is an important aspect of the HVACR technician's role. Troubleshooting involves reading schematic and pictorial diagrams, interpreting the information to isolate the problem and conduct the appropriate tests, and then replacing the correct component. To be effective in achieving the ultimate goal of correct diagnosis, you'll need a firm grasp of the fundamental concepts of electrical safety, basic electricity, and the proper use of test instruments.

This part of your program begins with an introduction to working safely. Then, you'll learn about the fundamental concepts of electricity and how they apply to HVACR equipment. This part of your program is based on the textbook, *Fundamentals of HVACR*. It's divided into eight sections, and each section covers a specific area of the HVACR trade.

By the end of this course, you'll be able to do the following:

- Describe the safety measures used when working with the different forms of electrical power systems
- Explain the operation of electrical motors and the process of interpreting electrical circuit diagrams

## Residential and Light Commercial HVACR Systems

As you've already learned, the work of a heating, ventilation, air-conditioning, and refrigeration (HVACR) technician covers many types of systems and requires a very broad range of technical skills. This part of your course continues the study of air-conditioning technologies by explaining how these systems are installed and serviced in residential and smaller commercial applications. It then follows a new direction by exploring all types of heating systems used in households, including those powered by gas, oil, and electricity. You'll learn how to work with real-world systems—rather than just why these systems work. Be sure to pay close attention to the practical tips and instruction contained in your lessons.

By the end of this course, you'll be able to do the following:

- Identify the fundamentals of psychometrics and the various functions of air filters and ventilation systems
- Distinguish the various operations, installation processes, and troubleshooting of refrigeration system and air-conditioning system
- Analyze the principles, functions, and safety measures involved in combustion, gas, and oil heating systems
- Categorize the various applications and troubleshoots of electric heating systems and heat pump systems

## HVACR System Design and Installation

In this course, you'll explore how heating, ventilation, air conditioning, and refrigeration (HVACR) play a huge role in the design of residential and commercial spaces. You'll learn about how HVACR is an integral part of all buildings and how taking into account issues like indoor air quality, duct design, and load calculations helps make buildings a safer place to live and work. You'll also discover the air conditioners, fans, and various systems and equipment that are in commercial buildings.

By the end of this course, you'll be able to do the following:

- Describe the components, calculations, and designs associated with building constructions and systems
- Analyze the methods of duct designing and the systems of zone controlling and air balancing
- Point out the components and purpose of air-conditioning, commercial control, chilled-water, and air-handling systems
- Distinguish between the types, components, and operating processes of chilled-water and hydronic heating systems

## Commercial Refrigeration Systems

This course focuses on refrigeration systems related to food preservation and processing, including ice machines. It provides a more general guide to the types of troubleshooting, installation, and maintenance work carried out by heating, ventilation, air conditioning, and refrigeration (HVACR) technicians every day.

This part of your program is based on the textbook, Fundamentals of HVACR. It's divided into seven sections, and each section covers a specific area of the HVACR trade.

You'll also study lithium bromide absorption systems, which will introduce you to some basic principles. You'll also study the function of each component within the system, typical component arrangements, capacity control options, recommended operation and maintenance of a lithium bromide absorption unit.

By the end of this course, you'll be able to do the following:

- Analyze the operations and troubleshoots related to supermarket refrigeration systems and ice machine equipment
- Point out the various troubleshoots concerning commercial refrigeration systems
- Categorize the major phases of installation, maintenance, and cleanup procedures in refrigeration systems
- Categorize the elements, components, parts, theories, and principles associated with the lithium bromide absorption systems

**Note:** The titles of your learning materials may be different from those listed on your program outline. There is no need to call your instructor about these differences. While the titles of certain learning materials may differ, the educational content is the same. All learning materials are designed to give you the finest education in your field. If you need instructional assistance, however, be sure to call for help. We reserve the right to revise the program of study and the instructional materials and to substitute for the items of equipment offered.