

# PHCC Academy®

## Fast Track to Service & Repair – HVACR

### Syllabus

#### Course Contact for Registration and Non-LMS Questions

State Chapter Partner

Refer to <https://phccacademy.org/state-chapter-partner-contacts/>

#### Course Contact for Technical Problems in Absorb LMS

PHCC Academy® staff – [academysupport@naphcc.org](mailto:academysupport@naphcc.org)

Welcome to the PHCC Academy® Online Fast Track to Service & Repair - HVACR course!

#### Course Description

Develop your entry level service technicians (residential or commercial) using a standardized HVACR service curriculum. Combined with on-the-job training activities, service technicians will gain the knowledge and skills necessary to perform their duties safely and efficiently. The course includes 33 online training modules critical for the success of today's HVACR professional. Module topics include professionalism in the workplace, safety and first aid, mathematic and scientific principles related to heating, ventilation, air conditioning, and refrigeration, electric and motor fundamentals for HVACR, and more.

#### Student Responsibilities

- Complete work in a timely manner.
- Read all information and assignments within the learning management system before starting the course.
- Complete all tests in this course as closed-book. Students are on the honor system.
- Complete all assignments with a passing grade of 70 percent or higher.
- Print certificate and give to employer with check list after completion of each module.

#### Employer Responsibilities

- Ensure that all students enrolled are proficient in reading and writing in English at a high school level and possess the self-motivation to complete internet-based coursework.
- Review module student is working on and send them to jobs to support their coursework.
- Complete work-based learning exercises with your student that accompany each module.

#### State Chapter Partner Responsibilities

- Register and enroll students in the course.
- Assist students with eBook and materials for their course.
- Act as the primary point of contact for students and employers who register for courses in their state.
- Serve as the liaison between the PHCC Academy® and employers or technicians enrolled in the program in their state.

## PHCC Academy® Responsibilities

- Develop and administer the course the learning management system.
- Provide students with learning management system usernames and passwords.
- Support all administrative functions on the learning management system.
- Provide a certificate to students upon successful completion of each module.

## Course Goals

- Define and describe the various duties and career possibilities in HVACR
- Discuss broadly the subject of HVACR Safety and identify initial first aid procedures for common worksite injuries or conditions
- Describe basic business operations for HVACR service companies and the importance of establishing a professional image
- Explain the importance of maintaining good customer service relationships
- Describe principles of heat transfer
- Provide a basic definition of pressure
- Explain the refrigeration cycle
- Explain how to use the pressure-temperature chart and the manifold gauge set to measure pressures and temperatures
- Identify fundamental electrical terms and electrical symbols used for schematics and diagrams
- Describe the importance of electrical safety
- Evaluate HVACR electrical case studies and describe electrical troubleshooting
- Identify motor components and describe basic motor functionality
- Identify motor types, their characteristics, and their applications
- Discuss basic math problem solving techniques
- Use mathematical concepts and rules to solve calculations commonly required in the HVACR industry
- Evaluate common HVACR measurements using geometry
- Describe general hand and power tool safety procedures, and explain lock out/tagout procedures
- Discuss HVACR materials and methods and identify joining methods
- Describe the components of a refrigeration system and accessories
- Describe cooling system information including cooling fluids, open and closed-loop systems, CFM rate, and sensible vs. latent heat
- Discuss recovery, recycling, and reclaiming of lubricants and identify safety and handling measures
- Define control systems
- Discuss leak detection methods and describe methods and procedures for sealing, evacuating, and charging cooling systems
- Identify the types of heating appliances
- Describe the combustion process and the dangers of carbon monoxide
- Describe boiler and pump operation and components
- Describe electrical and oil heating systems
- Identify types of air-source heat pumps

- Describe geothermal heat pumps
- Describe psychrometrics and its value in HVACR
- Describe indoor air quality
- Define ventilation and filtration and describe key considerations
- Describe air delivery systems
- Describe common problems in mechanically troubleshooting refrigeration and air conditioning equipment
- Describe common problems in mechanically troubleshooting heating and airflow systems
- Describe best practices in HVACR installation and service.

### **Required Textbook (Purchased Separately)**

Refrigeration & Air Conditioning Technology 9E: Eugene Silberstein, Jason Obrzut, John A. Tomczyk, William M. Johnson, William C. Whitman. © 2021, 2017 Cengage Learning, Inc.

### **Assignments**

In each module you will be required to do the following:

- Read Chapter
- Watch Lesson
- Take Exam

### **Modules**

#### Module 01 – Introduction to the HVACR Trade & Regulatory Codes

Describe HVACR-related certification requirements, industry roles, and responsibilities and explain the relationship between federal regulations, zoning laws, and building permit requirements for the HVACR industry.

- Know Your Role
- Cracking the Codes

#### Module 02 – HVACR Safety and Basic First Aid

Describe federal safety requirements applicable to the HVACR industry, and identify first aid or emergency techniques technicians can administer to treat various worksite conditions or stabilize injured parties until emergency services are available.

- Safety First (Then Coffee)
- It Only Hurts When I Laugh

#### Module 03 – Business Operations and Customer Service Expectations

Describe basic business operations for HVACR service companies and explain the importance of maintaining good customer service relationships related to initial contact, scheduled maintenance, and troubleshooting visits.

- Takin' Care of Business
- Can You Relate?
- Yesterday's Work
- Be a Straight Shooter

## Module 04 – Introduction to Thermodynamics

Describe basic principles of thermodynamics applicable for the HVACR industry and calculate sensible and latent heats for various contexts.

- It's Getting Hot in Here!
- Wanted in Three States
- A Case of the Vapors

## Module 05 – Pressure, Matter, and Scientific Law

Describe the relationship between temperature, pressure, and volume and explain the relevance of scientific laws (thermodynamics & gas) for the HVACR industry.

- Under Pressure

## Module 06 – Basic Refrigeration Cycle and Refrigerant States

Explain the refrigeration cycle, to include the relationship between pressures and temperatures within refrigeration systems, and explain how to measure refrigerant states for troubleshooting refrigeration systems.

- That's a Cool Cycle
- Superheat and Subcool

## Module 07 – Electrical Fundamentals, Components, and Schematics

Explain electrical fundamentals applied to the HVACR industry, describe common electrical system components and their functions, and describe the types and uses of electrical wiring diagrams.

- Elec-tricks
- Parts and Sparks
- A Symbolic Gesture

## Module 08 – Electrical Safety

Explain critical electrical safety principles and best practices when working with electricity and describe how to treat and prevent electrical shock.

- Shocking!

## Module 09 – Electrical Troubleshooting

Evaluate various HVACR electrical case studies to explain possible symptoms, causes, and appropriate solutions, or applications that could correct the electrical issues in HVACR systems.

- Ask the Conductor

## Module 10 – Motor Fundamentals

Explain the basic components, characteristics, and functions for various motors used in the HVACR industry and identify considerations and best practices for motor applications or installations.

- Motorvation
- I Thought You Said You Had a Hemi...

## Module 11 – Mathematical Problem Solving

Leverage the math problem solving process to accurately solve calculations commonly required in the HVACR industry using fractions, mixed numbers, decimals, and percentages.

- I Got 99 Problems...
- This is Pointless
- I See Your Point
- Keeping it 100!

## Module 12 – Solving Algebraic Equations

Leverage mathematical concepts and rules to solve calculations commonly required in the HVACR industry using ratios, proportions, and algebraic equations.

- Size Matters
- Rise to the Equation

## Module 13 – Geometry and Measurement

Leverage geometry and measurement concepts to solve linear measurement and conversion calculations commonly required in the HVACR industry.

- Measurement Rules

## Module 14 – HVACR Tools

Identify and describe the uses and safety procedures for both hand and power tools used in HVACR services.

- It's All in the Wrist
- This Is Not a Drill

## Module 15 – HVACR Materials and Joining Methods

Discuss properties and uses for HVACR materials and techniques and uses for joining methods.

- Living in a Material World
- Healthy Joints Are a Must

## Module 16 – Refrigeration System Components and Accessories

Describe the components of a refrigeration system and accessories, including the types, installation, and replacement schedules.

- Articles of Coolness
- Accessorize Smartly

## Module 17 – Cooling Equipment, Refrigerants, and A/C Piping

Identify the equipment, lubricants and refrigerants, and piping and tubing used in cooling and refrigeration systems and their uses.

- It Takes All Kinds
- I'm Like Your Cool "Aunt"
- Tubing or Not Tubing

## Module 18 – Control Systems

Describe control systems and identify the various types for heating and cooling and their operation and troubleshooting.

- Everything's Under Control

## Module 19 – Leak Detection, Evacuation, and System Charging

Describe methods and procedures for sealing, evacuating, and charging cooling systems.

- Reach for the Sealing
- Better Out Than In
- Gas It Up

## Module 20 – Heating Appliances

Identify the types of heating appliances and describe common components and applications for gas heating systems.

- That's So Hot
- Got Gas?

## Module 21 – Combustion

Describe the combustion process; carbon monoxide dangers, testing, and instruments; and both boiler and pump operation and components.

- Fuel + Air + Spark
- Steamy Situation

## Module 22 – Heating Systems

Describe electrical and oil heating systems, including common elements, sequence of operation, and troubleshooting.

- Like a Toaster, Only Bigger
- Better Oily Than Late!

## Module 23 – Air-Source Heat Pumps

Identify types of air-source heat pumps and describe their function, performance, installation, maintenance, and troubleshooting.

- Air-Source One

## Module 24 – Geothermal Heat Pumps

Identify and describe types of geothermal heat pumps and their cost, installation, maintenance, and troubleshooting.

- Going Underground

## Module 25 – Psychrometrics

Describe psychrometrics and identify psychrometric terms and the human comfort zone; describe gas laws, types of sling psychometers, and use of the psychrometric chart; and describe air quality and moisture control.

- Don't Say Moist

### Module 26 – Comfort and Health

Describe indoor air quality; identify the causes, standards, and DOE requirements for Sick Building Syndrome; and address customer relations issues related to air quality.

- Dude that is SICK!

### Module 27 – Ventilation and Filtration

Define ventilation and filtration and describe key considerations associated with each.

- This is Particularly Important

### Module 28 – Air Delivery Systems and Technician Measurements

Describe air delivery systems and discuss cleaning, sealing, maintenance, and testing, including technician measurements.

- Special Delivery

### Module 29 – Troubleshooting Refrigeration Equipment

Diagnose common problems with refrigeration equipment through mechanical troubleshooting.

- Put it on Ice

### Module 30 – Troubleshooting Air Conditioning Equipment

Diagnose common problems with air conditioning systems through mechanical troubleshooting.

- Don't Lose Your Chill

### Module 31 – Troubleshooting Heating Systems

Diagnose common problems with heating systems through mechanical troubleshooting.

- Hot and Bothered

### Module 32 – Troubleshooting Airflow Problems

Diagnose common problems with airflow through mechanical troubleshooting.

- Time to Clear the Air

### Module 33 – HVACR Industry Best Practices

Describe best practices in HVACR installation and service.

- Practice Makes Perfect

## **Final Exam**

## **Course Evaluation**