Lesson 1 - Trade Tools
Objectives:

- Explain the importance of using proper trade tools and test instruments.
- List the various types of wrenches, and describe their use.
- Describe the proper procedures for bending, flaring, and swaging tubing.
- Describe the correct use of pinch-off tools.
- Describe the proper techniques for soldering and brazing.
- Identify various types of diagnostic tools and testing instruments.
- Identify various refrigerant charge tools, and explain how they are used.
- Explain the reasons for using safety goggles.

Lesson 2 - Electricity for the Service Technician (Part 1)
Objectives:

- Define alternating current, direct current hertz (cycles per second), volts, amperes, and ohms.
- Apply Ohm’s Law to calculate voltage, current, resistance, and power in pure load circuits.
- Describe single-phase and three-phase circuits.
- Explain what the terms grounding, grounded, and ground mean.
- State how, when and where a voltage check on equipment should be made.
- Explain what causes low voltage.

Lesson 3 - Electricity for the Service Technician (Part 2)
Objectives:

- Define power.
- Explain the difference between maximum voltage and effective voltage.
- Calculate power factors.
- Explain how a transformer operates.
- Explain the difference between “delta” and “star” or “Y” connections.
- Troubleshoot motor complaints.

Lesson 4 - Electric Motors in Refrigeration Systems
Objectives:

- Explain the basic principles of operation of electric motors.
- Calculate motor speed and slip.
- Describe the characteristics of various types of single-phase ac motors, including split-phase motors, capacitor-start motors, capacitor-start, capacitor-run motors, repulsion-induction motors, and shaded pole motors.
- Explain the difference between single-phase and three-phase motors.
- List the three main types of three-phase squirrel-cage motors, and describe the distinguishing characteristics of each.
- Identify the three main types of dc motors.
- Explain how current-type and voltage-type starting switches operate.
Lesson 5 - Motor Capacitors
Objectives:
- Identify the two types of capacitors used with electric motors.
- Explain the difference between electrolytic and oil-paper capacitors.
- Explain how capacitors are rated.
- Calculate the capacitance for capacitors connected in series or parallel.
- Describe the operation of starting relays.
- List the main causes of start capacitor failure.

Lesson 6 - Motor Protectors
Objectives:
- Explain the function of a motor protector.
- Describe how an overload relay operates.
- Explain the function of a circuit breaker.
- Describe how external and internal protectors operate.
- Explain how protectors are used with motors.

Lesson 7 - Low-Voltage Thermostats
Objectives:
- Describe the functions performed by low-voltage thermostats.
- Identify the various types of low-voltage thermostats.
- Define the terms setpoint, make point, break point, and differential as they apply to low-voltage thermostats.
- Explain how anticipation works.
- List the proper guidelines for installing and troubleshooting various types of low-voltage thermostats.

Lesson 8 - Introduction to Pneumatic Controls (Part 1)
Objectives:
- Name the four basic elements of control systems and describe their functions.
- Identify the six basic functions of fully automatic control equipment.
- Define the following terms used in HVAC/R controls: setpoint, control point, offset, deviation, and differential.
- Explain what the terms "controller throttling range" and "proportional band" mean.
- Explain how controllers are classified.
- Describe the design, construction, and operation of various types of thermostats and controllers.
- Define the terms throttling range, proportional band, and differential as they apply to controllers.

Lesson 9 - Introduction to Pneumatic Controls (Part 2)
Objectives:
- Describe the function and operation of various types of switching, reversing, volume-amplifying, and positive positioning pneumatic relays.
- Troubleshoot valve actuator applications and operational problems.
• Troubleshoot damper actuator applications and operational problems.
• Explain the difference between mixing valves and diverting valves.
• Explain the difference between a parallel-blade damper and an opposed blade damper.
• Calculate the correct sizing of actuators.

Lesson 10 - Direct Digital Controls
Objectives:
• Explain the differences between direct digital control (DDC) and pneumatic controls.
• Explain the principles of operation of a typical DDC system.
• Describe the various strategies used in energy management.
• Describe the various types of user-machine interfaces.
• Explain how a building automation system can be used to aid in facilities management and troubleshooting.

Lesson 11 - Troubleshooting (Part 1)
Objectives:
• Conduct a customer interview.
• Identify the instruments required for performing specific troubleshooting tasks.
• Follow step-by-step procedures in analyzing a problem.
• Describe the most common causes of system malfunctions.

Lesson 12 - Troubleshooting (Part 2)
Objectives:
• Explain the need for following safe procedures when troubleshooting electrical problems.
• Plan and carry out an orderly course of action for diagnosing and correcting electrical problems.
• Describe some of the most common electrical problems encountered in HVAC/R systems.

Lesson 13 - Troubleshooting (Part 3)
Objectives:
• Diagnose compressor malfunctions.
• Evaluate compressor performance by using external testing devices.
• Identify possible causes of compressor failure by performing an internal inspection, where possible.

Lesson 14 - Troubleshooting (Part 4)
Objectives:
• Diagnose typical problems that may occur in condensers and cooling towers, and describe the related troubleshooting procedures.
• Diagnose typical problems that may occur in piping systems, and describe the related troubleshooting procedures.
• Explain the proper application of various HVAC/R accessories.

Lesson 15 - Troubleshooting (Part 5)
Objectives:
• Identify the causes of common problems in pumping systems.
- Follow a logical, step-by-step approach in troubleshooting control systems.
- Isolate the causes of malfunctions in chiller systems.
- Observe proper application procedures in electric heating applications.
- Identify the causes of common problems in fan installations.

Lesson 16 - Compressor Replacement and System Evacuation

Objectives:
- Describe the proper procedures for diagnosing compressor problems.
- Distinguish between mechanical failures and compressor burnout.
- Describe the proper procedures for replacing compressors.
- List and observe the necessary safety precautions.
- Explain what “dehydrating the system” means.
- Identify and describe the various methods of evacuation.
- Describe how a high-vacuum pump can be used to evacuate a system adequately.
- Define a micron.
- List the instruments used in the field to indicate high-vacuum conditions.
- Explain why the size of the connecting line between the vacuum pump and the system is so important.