

### HVAC SYSTEMS PROGRAM OVERVIEW

The Daikin HVAC Systems Program combines the knowledge and experience of Daikin's Principles of HVAC, Principles of Air Systems Design, Principles of Refrigeration, Principles of Chiller Plant Design, and Building Systems classes into one comprehensive program that uses a blended learning approach

This blended learning approach utilizes both **VIRTUAL INSTRUCTOR LEAD (VILT)** and **SELF-DIRECTED** methods to provide flexibility to complete the program, within the allotted time frame.

This program is geared towards those new to the industry, as well as intended to be a refresher series for those who already have some HVAC knowledge.

#### Target audience:

- Engineers
- Building Operators
- Contractors

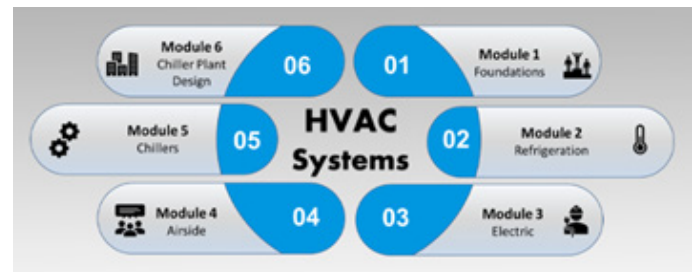
#### This higher education level course includes:

- Access to online course content for up to one (1) year
- Five (5) month live instructor access
- Daikin HVAC Fundamentals textbooks

#### Daikin HVAC Systems Program Cost

Per Person: **\$1000**

For registration questions,  
please contact:  
**TRAINING@HAVTECH.COM**  
or  
**WWW.HAVTECH.COM/TRAINING**



### 6 MODULE PROGRAM

#### ▲ 1. FOUNDATIONS OF HVAC

Be introduced to HVAC systems, thermodynamics, Psychrometrics, intro to plans, hydronics and pumps.

#### ▲ 2. REFRIGERATION

Examine the refrigeration cycle, the components of a refrigeration cycle, and energy recovery for refrigeration

#### ▲ 3. ELECTRIC

Develop knowledge of electrical basics, motors and VFDs, controls concepts for HVAC, controls components, and electrical schematics

#### ▲ 4. AIRSIDE

Gain a basic understanding of coils, fans, air handling units, air distribution, rooftop units, and controls for air handler units

#### ▲ 5. CHILLERS

Begin by learning chiller basics and chiller types, then move on to learn constant flow systems, variable flow systems, Low Delta T, condenser water systems and cooling towers, and controls.

#### ▲ 6. CHILLER PLANT DESIGN

Develop knowledge of Chiller Plant Variations, Optimization, Energy Recovery, Water-Side-Free Cooling, Thermal Storage Systems, Process Cooling, District Cooling

HVAC Systems Program	Estimated Hours to Complete	CEU Credit Eligibility
	49	4.9

## SEMESTER B SCHEDULE

### August – December 2022

- Module 00 and 01 are pre-requisites for all additional Modules (02-06)
- ONE Date/Time per VILT Pathway is required; each VILT session is 90 minutes and are stated in EST
- Two weeks prior to each module's start date, an e-mail will be sent to choose a VILT session on a first come, first served basis

MODULE	PATHWAY	Est. Hrs.	CEU Credits	DATES			
				* Subject to change – official dates will be confirmed before class begins.			
Module 00 Orientation	<b>Orientation (VILT)</b>	0.0	0.0	10-Aug 11:00am	11-Aug 11:00am	15-Aug 11:00am	16-Aug 11:00am
Module 01 Foundations	<b>Intro to HVAC (VILT)</b>	8	0.8	17-Aug 11:00am	18-Aug 11:00am	24-Aug 11:00am	25-Aug 11:00am
	Intro to Plans			Self-directed content to do online between August 10 – August 25			
	Thermodynamics						
	Psychrometrics						
Hydronics and Pumps							
Module 02 Refrigeration	<b>Refrigeration Components (VILT)</b>	6	0.6	7-Sep 11:00am	8-Sep 11:00am	14-Sep 11:00am	15-Sep 11:00am
	Refrigeration Cycle			Self-directed content to do online between September 7 – September 15			
	Energy Recovery for Refrigeration						
Module 03 Electric	<b>Motors and VFDs (VILT)</b>	10	1	28-Sep 11:00am	29-Sep 11:00am	5-Oct 11:00am	6-Oct 11:00am
	Electrical Basics			Self-directed content to do online between September 28 – October 6			
	Electrical Schematics						
	Controls Concepts for HVAC						
	Controls Components						
Module 04 Airside	<b>Air Distribution (VILT)</b>	7	0.7	19-Oct 11:00am	20-Oct 11:00am	26-Oct 11:00am	27-Oct 11:00am
	Coils			Self-directed content to do online between October 17 – October 27			
	Fans						
	Air Handler Units						
	Rooftop Units						
	Controls for Air Handler Units						
Module 05 Chillers	<b>Chiller Types (VILT)</b>	10	1	9-Nov 11:00am	10-Nov 11:00am	16-Nov 11:00am	17-Nov 11:00am
	Chiller Basics			Self-directed content to do online between November 9 – November 17			
	Constant Flow Systems						
	Variable Flow Systems						
	Low Delta T						
	Condenser Water Systems & Cooling Towers						
	Controls						
Module 06 Chiller Plant Design	<b>Chiller Plant Variations (VILT)</b>	8	0.8	7-Dec 11:00am	8-Dec 11:00am	14-Dec 11:00am	15-Dec 11:00am
	Chiller Plant Optimization			Self-directed content to do online between December 7 – December 15			
	Energy Recovery for Refrigeration						
	Water-Side-Free-Cooling						
	Thermal Storage in CHW Systems						

## MODULE 1: FOUNDATIONS

Total CEU Credit Hours for Module

Est. Hrs. to Complete: 8

CEU Credits Eligibility: 0.8

### INTRO TO HVAC VILT

- Identify each type of HVAC equipment (water-cooled chiller, air-cooled chiller, water-source heat pump, rooftop unit, air handler unit, air terminal system, and variable refrigerant volume)
- Explain how each type of equipment works in a system

### INTRO TO PLANS SELF-DIRECTED ONLINE CONTENT

- Read the sequence order of a plan to use in the field
- Identify the most common HVAC-associated symbols on a plan
- Identify the scale of a given plan
- Use the support column grid to successfully navigate a plan
- Identify the correct sequence of key components
- Explain how the key components fit into piping, duct work, and plumbing

### THERMODYNAMICS SELF-DIRECTED ONLINE CONTENT

- Describe the differences between latent and sensible heat
- Describe each type of heat transfer (radiation, conduction, and convection)
- Provide examples of each type of heat transfer
- Calculate heat transfer to size a coil (sales) or to check coil efficiency (service)
- Explain the relationship between pressure and temperature

### PSYCHROMETRICS SELF-DIRECTED ONLINE CONTENT

- Read a psychrometric chart and locate a state point on the chart
- Use a psychrometric chart to calculate the state point between outside air and return air in order to determine the correct damper positioning
- Explain the relationship between air flow and humidity, and the impact equipment could have on each
- Plot key types of HVAC equipment on a psychrometric chart
- Explain how to remove latent or sensible energy by confirming or sizing a refrigerant coil

### HYDRONICS AND PUMPS SELF-DIRECTED ONLINE CONTENT

- Identify key components of a hydronic system
- Accurately read a pump curve
- Identify causes for cavitation in a pump
- Convert measurements from Pounds per Square Inch Gauge (PSIG) to Foot of Head (FtHd)
- Calculate an equivalent piping length

**MODULE 2:  
REFRIGERATION**

**Total CEU Credit Hours for Module**

**Est. Hrs. to Complete: 6**

**CEU Credits Eligibility: 0.6**

**REFRIGERATION CYCLE COMPONENTS VILT**

- Identify the primary components of the refrigeration cycle
- Explain the purpose of each primary component of the refrigeration cycle
- Identify the secondary components of the refrigeration cycle
- Explain the correct sequence of the refrigeration cycle components
- Explain the refrigerant state in each stage of the refrigeration cycle

**REFRIGERATION CYCLE SELF-DIRECTED ONLINE CONTENT**

- Explain the purpose of the refrigeration cycle within HVAC system
- Explain latent, sensible, and specific heat within the refrigeration cycle
- Identify the areas of the refrigeration cycle where specific types of heat are transferred
- Identify different applications where the refrigeration cycle is used

**ENERGY RECOVERY FOR REFRIGERATION SELF-DIRECTED ONLINE CONTENT**

- Explain energy recovery applications that affect refrigeration
- Explain environmental conditions where energy recovery is the best application
- Identify energy recovery applications by their piping layout

## MODULE 3: ELECTRIC

Total CEU Credit Hours for Module

Est. Hrs. to Complete: 10

CEU Credits Eligibility: 1

### MOTORS AND VFDS VILT

- Explain how a motor operates
- Identify the HVAC types of motor designs and configurations
- Explain how the types of motor starters function
- Explain power factor as it applies to motors

### ELECTRICAL BASICS SELF-DIRECTED ONLINE CONTENT

- Explain how power distribution works
- Explain how electricity flows
- Use Ohm's Law to calculate current, voltage, and resistance
- Explain the relationship between electricity and magnetism
- Explain how the basic components in electrical equipment work (switches, fuses, contactors, relays, capacitors, resistors/resistance/electrical loads, diodes, transformers, and thermostats)

### ELECTRICAL SCHEMATICS SELF-DIRECTED ONLINE CONTENT

- Identify electrical terms, acronyms, and symbols
- Explain how to read an electrical schematic
- Identify practical approaches to problem solving when working with an electrical system

### CONTROLS CONCEPTS FOR HVAC SELF-DIRECTED ONLINE CONTENT

- Describe the three levels of controls for HVAC (unit, system, BMS/BAS)
- Explain how key terminology is used in the control process
- Explain the basic control strategies
- Explain the four different types of control point
- Describe the four types of modulating controls

### CONTROLS COMPONENTS SELF-DIRECTED ONLINE CONTENT

- Describe the types of control sensors
- Describe the types of control dampers
- Describe the types of valves

## MODULE 4: AIRSIDE

Total CEU Credit Hours for Module

Est. Hrs. to Complete: 7

CEU Credits Eligibility: 0.7

### AIR DISTRIBUTION VILT

- Identify different methods of air distribution
- Explain how each method of air distribution works

### COILS SELF-DIRECTED ONLINE CONTENT

- Describe different coil types
- Explain the different uses and benefits of each coil type

### FANS SELF-DIRECTED ONLINE CONTENT

- Use fan curves and fan laws to determine the most useful fan type for a specific application
- Identify fan type by blade configuration
- Determine the safe operation range of a fan type
- Explain fan laws and why they are used

### AIR HANDLER UNITS SELF-DIRECTED ONLINE CONTENT

- Identify the major components in an air handler unit
- Explain the function of the major components in an air handler unit under varying conditions
- Explain the importance of casing design in air handler unit performance

### ROOFTOP UNITS SELF-DIRECTED ONLINE CONTENT

- Identify the major components in a rooftop unit
- Explain the function of the major components in a rooftop unit
- Describe the differences between a DOAS and a standard rooftop unit

### CONTROLS FOR AIR HANDLER UNITS SELF-DIRECTED ONLINE CONTENT

- Describe control strategies for air handler units
- Explain the interaction of AHU and RTU controls to include air flow, enthalpy, temperature, and pressure

## MODULE 5: CHILLERS

Total CEU Credit Hours for Module

Est. Hrs. to Complete: 10

CEU Credits Eligibility: 1

### CHILLER TYPES VILT

- Demonstrate the ability to knowledgeably discuss chiller basics
- Explain how an air-cooled chiller works
- Explain how a water-cooled chiller works
- Explain the basics of an absorption chiller
- Knowledgeably discuss relevant AHRI standards

### CHILLER BASICS SELF-DIRECTED ONLINE CONTENT

- Explain lift, or pressure ratio
- Explain the Carnot Cycle and Coefficient of Performance (COP)
- Describe condenser water relief using AHRI standards

### CONSTANT FLOW SYSTEMS SELF-DIRECTED ONLINE CONTENT

- Explain how constant flow systems function in single chiller plants, parallel chiller plants, and series chillers
- Explain series counter flow

### VARIABLE FLOW SYSTEMS SELF-DIRECTED ONLINE CONTENT

- Describe how a primary-secondary water system works
- Explain a variable primary flow system
- Explain pump control related to variable flow systems
- Explain chiller staging

### LOW DELTA T SELF-DIRECTED ONLINE CONTENT

- Explain Low Delta T and Low Delta T Syndrome
- Determine possible causes of Low Delta T

### CONDENSER WATER SYSTEMS AND COOLING TOWERS SELF-DIRECTED ONLINE CONTENT

- Demonstrate an understanding of Cooling Technology Institute (CTI) standards for cooling towers
- Describe approach and range of a cooling tower
- Explain Total Dissolved Solids (TDS) and the importance of make-up water
- Distinguish different configurations of cooling towers

### CONTROLS SELF-DIRECTED ONLINE CONTENT

- Describe the general control sequence of operation for a chiller
- Explain how leaving chilled water reset works
- Identify external equipment that can be controlled with Daikin chillers
- Explain how system design and control sequence can help with Low Delta T Syndrome and compressor short cycling
- Describe the basic sequence of operation for primary-secondary flow and variable primary flow

## MODULE 6: CHILLER PLANT DESIGN

Total CEU Credit Hours for Module

Est. Hrs. to Complete: 8

CEU Credits Eligibility: 0.8

### CHILLER PLANT VARIATIONS VILT

- Discuss key considerations for alternative fuels in chiller plant design
- Explain the requirements for a hybrid plant design
- Describe methods of preferential chiller loading
- Explain the advantage of tertiary piping in specific applications
- Describe the impact of tall buildings on system design

### CHILLER PLANT OPTIMIZATION SELF-DIRECTED ONLINE CONTENT

- Explain load profile and why it is important
- Describe key design considerations
- Recommend design conditions for optimizing a chiller plant
- Describe various optimization tactics
- Explain chiller staging in chiller plant optimization

### ENERGY RECOVERY SELF-DIRECTED ONLINE CONTENT

- Explain energy recovery using a split condenser unit
- Explain why templifiers are used and the advantages and disadvantages of using templifiers in every recovery
- Explain how system design and control affect energy recovery

### WATER-SIDE-FREE COOLING SELF-DIRECTED ONLINE CONTENT

- Explain the advantages and disadvantages of different applications of water-side-free cooling
- Explain cooling tower sizing
- Describe the sequence of operation for water-side-free cooling

### THERMAL STORAGE IN CHW SYSTEMS SELF-DIRECTED ONLINE CONTENT

- Explain load profile (run time) related to thermal storage
- Explain the difference between full and partial load storage
- Describe the differences between thermal storage technologies

### PROCESS COOLING SELF-DIRECTED ONLINE CONTENT

- Explain the difference between process cooling and comfort cooling
- Explain the impact of chiller selection for process cooling
- Describe different types of process cooling
- Describe operating conditions for process cooling

### DISTRICT COOLING SELF-DIRECTED ONLINE CONTENT

- Describe chiller plant design considerations related to district cooling
- Explain chiller staging as it relates to district cooling
- Describe the advantages of series counter flow chillers
- Explain the advantages of changing a primary secondary piping layout to a distributed piping system
- Explain the benefits of district cooling



## CEU Calculation Formula

### CEU Calculation

- To qualify for CEUs, a learner must
  - Complete all activities
  - Attend all VILTs
  - Pass all tests with a minimum of 80%

Module	Estimated Hours to Complete	CEU Credits Eligibility
01 - Foundations	8	0.8
02 - Refrigeration	6	0.6
03 - Electric	10	1
04 - Airside	7	0.7
05 - Chillers	10	1
06 - Chiller Plant Design	8	0.8
<b>TOTAL</b>	<b>49</b>	<b>4.9</b>