

### 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.

- Engineers
- Building Operators
- Contractors

Register today for the next FREE Fall 2021 program:

**FALL 2021**  
**AUGUST 2021 – DECEMBER 2021**  
Eligible for CEUs



### 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

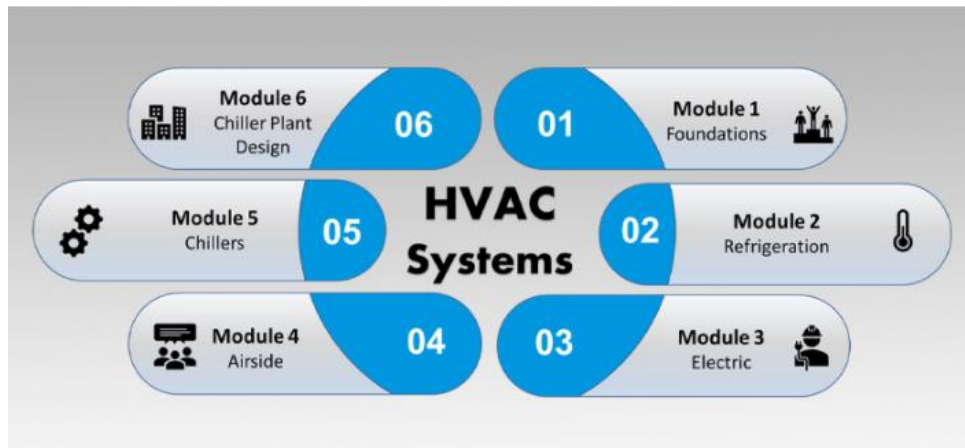
Gain a basic understanding of coils, fans, air handling units, air distribution, rooftop units, and controls for air handler units

#### 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 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.

- Engineers
- Building Operators
- Contractors

For Registration Information or additional questions please contact:

[MARKETING@HAVTECH.COM](mailto:MARKETING@HAVTECH.COM)

Or

[WWW.HAVTECH.COM/TRAINING](http://WWW.HAVTECH.COM/TRAINING)

## 6 MODULE PROGRAM

### 1. Foundations of HVAC

*Be introduced to HVAC systems, thermodynamics, Psychrometrics, intro to plans, hydraulics 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*

### FALL 2021 SCHEDULE

- 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

MODULE	PATHWAY	DATES			
Module 00 Orientation	<b>Orientation (VILT)</b>	16-Aug 11:00am	16-Aug 1:00pm	17-Aug 11:00am	18-Aug 1:30pm
Module 01 Foundations	<b>Intro to HVAC (VILT)</b>	18-Aug 11:00am	19-Aug 11:00am	25-Aug 11:00am	31-Aug 11:00am
	<b>Intro to Plans (VILT)</b>	24-Aug 11:00am	25-Aug 11:00am	27-Aug 11:00am	2-Sep 11:00am
	<b>Thermodynamics</b>	<b>August 16 - September 3</b>			
	<b>Psychrometrics</b>				
	<b>Hydronics and Pumps</b>				
Module 02 Refrigeration	<b>Refrigeration Components (VILT)</b>	1-Sep 11:00am	7-Sep 11:00am	8-Sep 11:00am	9-Sep 11:00am
	<b>Refrigeration Cycle</b>	<b>August 30 – Sept 10</b>			
	<b>Energy Recovery for Refrigeration</b>				
Module 03 Electric	<b>Electrical Basics (VILT)</b>	20-Sep 11:00am	21-Sep 11:00am	22-Sep 11:00am	23-Sep 11:00am
	<b>Motors and VFDs (VILT)</b>	29-Sep 11:00am	5-Oct 11:00am	6-Oct 11:00am	7-Oct 11:00am
	<b>Electrical Schematics</b>	<b>September 20 – October 8</b>			
	<b>Controls Concepts for HVAC</b>				
	<b>Controls Components</b>				
Module 04 Airsides	<b>Air Distribution (VILT)</b>	13-Oct 11:00am	18-Oct 11:00am	20-Oct 11:00am	21-Oct 11:00am
	<b>Coils</b>	<b>October 11 – October 22</b>			
	<b>Fans</b>				
	<b>Air Handler Units</b>				
	<b>Rooftop Units</b>				
	<b>Controls for Air Handler Units</b>				
Module 05 Chillers	<b>Chiller Basics (VILT)</b>	26-Oct 11:00am	27-Oct 11:00am	2-Nov 11:00am	3-Nov 11:00am
	<b>Chiller Types (VILT)</b>	28-Oct 11:00am	3-Nov 11:00am	4-Nov 11:00am	11-Nov 11:00am
	<b>Constant Flow Systems</b>	<b>October 25 – November 12</b>			
	<b>Variable Flow Systems</b>				
	<b>Low Delta T</b>				
	<b>Condenser Water Systems and Cooling Towers</b>				
	<b>Controls</b>				
Module 06 Chiller Plant Design	<b>Chiller Plant Variations (VILT)</b>	17-Nov 11:00am	18-Nov 11:00am	1-Dec 11:00am	2-Dec 11:00am
	<b>Chiller Plan Optimization</b>	<b>November 15 – December 3</b>			
	<b>Energy Recovery for Refrigeration</b>				
	<b>Water-Side-Free-Cooling</b>				
	<b>Thermal Storage in CHW Systems</b>				
	<b>Process Cooling</b>				
	<b>District Cooling</b>				

## MODULE 1: FOUNDATIONS

### HVAC SYSTEMS OVERVIEW 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 VILT

- 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

### 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

### ELECTRICAL BASICS VILT

- 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)

### 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 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

### 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

### CHILLER BASICS VILT

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

### 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

### 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

### 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	Allowable Minutes	Allowable Hours	CEUs
01 - Foundations	465	7.75	0.8
02 - Refrigeration	330	5.5	0.6
03 - Electric	600	10	1
04 - Airside	445	7.41	0.7
05 - Chillers	570	9.5	1
06 - Chiller Plant Design	495	8.25	0.8
<b>TOTAL</b>	<b>2905</b>	<b>48.41</b>	<b>4.8</b>