Carrier University
2017 Course Catalog
In the early 20th century, Willis Carrier began his legacy of heating, ventilation and air conditioning (HVAC) innovation — and Carrier has trained the industry ever since. Carrier University is the premier learning organization in the HVAC industry. With locations throughout the world, Carrier University offers comprehensive HVAC training in a wide range of areas including technical skills, sales and marketing skills, business management, customer service, controls, design and sustainable building solutions.

**Carrier University has training courses for architects, building owners, consulting/specifying engineers, contractors, developers, facility managers, and HVAC instructors.**

Carrier University delivers these courses through traditional classroom settings, self-study materials, and online web-based systems.
Bynum Training Center is a 19,500-square-foot facility with five classrooms and a product lab outfitted with residential and commercial products. It includes a production studio with web development tools and video web casting capability. Carrier University utilizes a Learning Management System to provide online training classes and blended learning programs.

Carrier University classes offer a number of continuing education options.

Carrier University is accredited by the International Association for Continuing Education and Training (IACET). Carrier University complies with the ANSI/IACET Standard, which is recognized internationally as a standard of excellence in instructional practices. As a result of this accreditation, Carrier University is authorized to issue the IACET CEU.

Founded in 1997, North American Technician Excellence (NATE) is the nation’s largest non-profit certification organization for heating, ventilation, air conditioning and refrigeration technicians. Headquartered in Arlington, VA, NATE is the certification organization governed, owned, operated, developed and supported by the entire HVAC/R industry.

Once certified, technicians need to maintain their credentials through Continuing Education Hours (CEH’s). Many Carrier University classes qualify for NATE CEH’s.

Carrier is a USGBC Education Partner, is the first company to license USGBC’s Leadership in Energy and Environmental Design (LEED®) curriculum, and is also the USGBC’s largest global partner for LEED education. Many Carrier University courses offered cover topics related to sustainability and may count to maintain GBCI LEED® credentials for CMP credit under the education category.
How to use the Catalog

**Classes are divided into three knowledge levels.**

- **Theory** – General industry knowledge
- **Skills** – Develop technical skills based on generic manufacturer’s equipment
- **Equipment** – Technical how-to knowledge for Carrier equipment

**Available Course Categories**

**Design**

- **Theory** – Fundamentals of HVAC design for contractors, consulting engineers and architects
- **Skills** – Understanding eDesign Suite software tools used in HVAC system design by consulting engineers and contractors

**Network controls**

Classes for control technicians, contractors and facility managers based on Carrier’s two available network systems: Carrier Comfort Network (CCN) and i-Vu Open

**Technician**

- **Theory** – Fundamentals for new HVAC technicians. This is an online class format
- **Skills** – These are hands-on fundamental classes designed to teach proper fundamental installation and troubleshooting techniques
- **Equipment** – These courses are designed for experienced technicians to gain understanding of maintaining and troubleshooting Carrier equipment

**Certification Legend**

- **NATE** – North American Technical Excellence – Continuing Education Hours (CEH’s) for residential and commercial technicians
- **IACET** – International Association for Continuing Education Training – Continuing Education Units (CEU’s) or Professional Development Hours (PDH’s) for technicians, contractors and engineers
- **CMP** – Credential Maintenance Program – These are continuing education hours which may qualify for GBCI LEED-based credentials under the education category
- **PE** – Continuing education hours for professional engineers’ continuing education requirement, some courses specifically approved by FL, NC, NJ and NY
- **FAD** – Factory Authorized Dealer – This credit is eligible for Carrier’s factory authorized dealer program

**Delivery Methods**

- **Classroom** – Traditional classroom format features hands-on lab exercise skills and equipment-based classes
- **Online** – Carrier University utilizes a learning management system to provide online class offerings that are available 24/7
- **Blended** – Mix of traditional online program with remote lab exercises and electronic access to instructor
- **Custom Classes** – If you have an interest in custom classes at your location or at the Carrier training center, contact carrieruniversity@carrier.utc.com
Registration

Instructors

Courses are taught by experienced HVAC professionals using materials and training aids developed exclusively by Carrier University staff.

Most classes are conducted at the Bynum Training Center

Bynum Training Center location:
6540 Old Collamer Road South
East Syracuse, New York 13057

Some classes are conducted at hosted sites. Training location information is posted on registration page.

Registration Process

You can view the Carrier University course schedule and important event information by going to www.carrieruniversity.com. Click on SCHEDULE and the easy-to-use site will guide you to register online.

Preferred method of payment for courses is credit card, and our online registration process allows you to enter your information with assurance of credit card safety.

A Purchase Order is also acceptable. Simply complete your Purchase Order and e-fax to Carrier University registrars at 1-860-775-2654. Your registration will be confirmed once your PO is fully approved.

All registered students will receive a CLASS CONFIRMED notice from Carrier University once the decision to hold the class is made.

IMPORTANT: Please do not make travel arrangements until you receive Class Confirmation from Carrier University.

Discounts

Carrier University offers multiple student discount rates of 5% per student on multiple student registrations if they are completed at the same time for the same event.

Cancellation Policy

Cancellations or rescheduling four weeks prior to the class start date will be refunded in full. Cancellations made three weeks prior to the class start date will be charged 50% of the class fee. For cancellations made ten days prior to the class start date – no refund will be issued.

Carrier University Contact Information – Registration Assistance
www.carrieruniversity@carrier.utc.com or Call 800-644-5544
General Information

Schedule of classes is available on www.carrieruniversity.com.

Lodging

Rooms and meals are available at hotels and restaurants convenient to the training center. Class confirmed email will have links to recommended hotels.

Class Hours

Courses begin promptly and run from 8:00 AM to 5:00 PM except as noted on Carrier University website. Do not make travel departure arrangements before the end of class.

What to Wear

Work clothes and work shoes appropriate to the type of work to be performed in the class.

What to Bring

Some classes require computers. Check notes on the Carrier University website page for any special requirements.

Prerequisites

Some classes require prerequisite classes to be taken ahead of time. These will be noted on the Carrier University website. Registration will not be accepted without proper prerequisite class completion.

Directions

Can be found on the www.carrieruniversity.com website.

Tuition

Fee covers cost of course and related material. It does not include meals, lodging and transportation.

More Information

For complete details on each of these courses, including syllabus, course completion requirements, prerequisites, learning outcomes, what you will receive and class details, go to www.carrieruniversity.com.
Design Skills

Design Curriculum Track

Carrier University design courses provide the tools to design sustainable high-performance HVAC systems.

ABC’s of Air Conditioning
OL002 (ONLINE)

This on-line course provides people new to the industry and non-technical people a concise overview of air conditioning. It addresses the topics of: Human Comfort, The Air Cycle, Refrigeration Cycle, The Heat Pump and Air Conditioning Equipment. The course includes section tests and a final exam. To receive FAD credit you must pass the final exam.

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ACCESS IS AVAILABLE FOR 2 WEEKS AFTER FIRST LOG-IN

Basic Refrigeration Cycles
OL003 (ONLINE)

This online training program covers all the various types of refrigeration cycles commonly used in today’s air conditioning systems. The program covers positive displacement, centrifugal, and absorption cycles with details on related compressors and systems. It also discusses principal components of each cycle and how they function. The course includes section tests and a final exam. To receive FAD credit you must pass the final exam.

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HVAC System Design for Contractors
CSD 150

This introductory design course is targeted at contractors, design build contractors, utility customer representatives, territory managers, sales support people, and anyone involved with designing or applying HVAC equipment in light commercial projects. Basic HVAC concepts are presented in just enough detail for the student to understand how to apply each of the design steps. The course walks step-by-step through the complete system design on a light commercial building. At the end of the course, a participant will be able to do an electronic cooling/heating load, select packaged or split system equipment, design an air distribution system, select and lay out the controls, and design a refrigerant piping system as applied on a light commercial project. At the end of the course a participant should be able to apply the design steps to quickly and accurately design HVAC systems for the majority of projects in commercial buildings less than 50,000 square feet.

No prior experience in commercial system design is required.

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Introduction to High Performance HVAC
CSD 101
For anyone involved in the selection, design, operation, or maintenance of commercial buildings, a working knowledge of the various HVAC systems is essential. This class is targeted at building professionals with 0-3 years experience who want to expand their knowledge of HVAC systems, their proper application, and how to achieve high-performance operation. The class starts with an explanation of the environmental conditions which influence comfort and how HVAC systems control these conditions. Participants learn about the design process and criteria for system selection. The various classifications of HVAC systems and associated distribution systems are explained along with the function and operation of all the major system components. The class evaluates over 15 types of HVAC systems, describing how the systems work, applications and basic advantages and shortcomings. Each system type is evaluated based on performance for energy and water use, first cost, life cycle cost, and comfort performance. System options and modifications which contribute to energy efficiency, sustainability, and high performance are also explored. The class consists of a mix of presentation and workshops which give the student opportunity to apply the concepts presented. Students will be better able to make informed decisions about the best choices of HVAC systems for various applications and how systems can best meet the project goals of performance, comfort, cost, and sustainability.

This course is run at the end of the week before the CSD400 HVAC Design Fundamentals and can serve as a good introduction to that class.

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Fundamentals of HVAC Design
CSD 400
This course covers the subjects that are fundamental in the design of all types of HVAC systems. Students learn the fundamental principles of HVAC design, including psychrometrics, heat transfer, mechanical refrigeration, and load estimating. Participants will become proficient with HVAC’s two most important design tools, the psychrometric chart, and the pressure enthalpy diagram. At the completion of the course, participants know how to do an accurate commercial load estimate that is the basis to the other system design decisions. In addition, the participant will be able to use psychrometric principles and the P-h diagram to describe and analyze HVAC processes. The concepts of this course are a recommended prerequisite for taking the other three courses and the building blocks of the student’s HVAC design career. Computer-assisted work sessions and a design project are used to practice the principles taught.

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Single Zone Systems and Air Distribution
CSD 500
Comfort conditions for spaces in a commercial building may be achieved in one of two basic ways: by applying single zone units to each space or by using systems that provide control to multiple spaces. This course centers on the skills and knowledge necessary to design one of the most common HVAC systems, a constant volume air distribution system using single zone packaged and split system equipment. The principles taught in this class will help anyone involved in the design or renovation of projects using single zone packaged equipment to develop more quickly cost-effective designs. Participants learn to determine building zones and acceptable compromises in comfort control. How to design the air distribution system for good air motion and sizing of the duct system is covered in detail. Achieving the most effective selection of packaged (roof-top) and split system equipment is covered and how to develop a sequence of control to maintain comfort design. Participants use workshops to apply the material covered in the class to a typical project. Computer-assisted work sessions are used to practice the skills.

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Zoned Air Systems
CSD 600
Comfort conditions for spaces in a commercial building may be achieved in one of two basic ways: by applying single zone units to each space or by using systems that provide control to multiple spaces. This course covers the skills and knowledge needed to design systems that control multiple zones using all air systems. Two of the basic all-air zoning systems – Variable Volume/Variable Temperature (VVT) and Variable Air Volume (VAV) are covered in depth. Other all-air systems (Double Duct, Multizone, etc.) are also discussed. In this course participants learn how to zone a building when more than one building zone is served from one air handler. Variable Volume/Variable Temperature systems allow constant volume packaged equipment to meet the varying load requirements of a zoned building. Variable Air Volume systems use applied and special packaged equipment to change air volume to achieve space conditions in each building zone. Students learn to design for the impacts of these multiple zone systems and their effects on design decisions, load estimates, equipment selections, room air distribution, duct design, and control sequence. Participants use workshops to apply the material covered in the class to a typical project. Computer-assisted work sessions are used to practice the skills.

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Design Skills

Applied Water System Design
CSD 700

Larger commercial buildings often use chilled water distribution systems rather than packaged or split system DX (Direct Expansion). This course centers around the skills and knowledge needed to design an applied chilled water system for a multiple-zoned commercial building. In this course participants learn how to zone a building when more than one building zone and air handler are served from one central chilled water plant. Participants will learn how initial decisions, load estimates, and equipment selection are impacted when applied water systems will be used. The course covers various piping and pumping systems, the selection of chillers, pumps, cooling towers, and control valves. Students learn to design dedicated ventilation systems that achieve required zone ventilation, to design the piping distribution system and develop the system’s control sequence for a chilled water system. The course addresses the application of fan coil and chilled beam systems as well as air handlers applied on constant and variable volume systems. Participants use workshops to apply the material covered in the class to a typical project. Computer-assisted work sessions are used to practice the skills.

Load Calculation for Commercial Buildings
SSN001

This hands-on course covers cooling and heating loads for commercial buildings using load calculation software. Students learn the fundamentals of design weather data, scheduling of loads, defining building parameters, and modeling various air system and plant types. Completion of the load calculation workshops is required to get a certificate. The class manual furnished to each student includes detailed workshops for defining Single Zone Constant Volume, Variable Air Volume and Terminal air systems as part of the course. Students who complete this course are able to calculate heating and cooling loads for commercial buildings in order to properly size the HVAC system.

Applied Water System Design
CSD 700

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NEW Consulting Engineer Training Program
CEP 101

This class is designed for recently graduated engineers entering the HVAC field as consulting engineers. This five-day program will provide an overview of HVAC terms, concepts and system fundamentals to enhance the ability to properly run loads and energy models while understanding the validity of output from these modeling tools. Workshops will be utilized for specific topics in order to build confidence in each of the key skills identified in the class syllabus. In addition, a fully functioning lab will be utilized daily to further enhance the learning process. Six online prerequisite topics are made available prior to the class to baseline class knowledge. One multiuse building will be utilized throughout the entire course. Additional online training modules will be made available for 6 months after class completion. Class size is very limited to provide maximum interaction with instructors. At the end of this course participants will be able to recognize and use common HVAC terms and concepts, use load and energy software and recognize appropriate results, select and lay out diffusers and size duct, and develop a sequence of operation and a points list for single zone and VAV systems.

Load Calculation for Commercial Buildings
SSN001

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eDesign Suite Software Curriculum Track

 Carrier University eDesign training helps designers use the eDesign software more productively.

SSN001: Load Calculation for Commercial Buildings
SSN002: Energy Simulation for Commercial Buildings
SSN003: Block Load Basic Training
SSN004: Engineering Economic Analysis
SSN005: Energy Modeling for LEED® Energy & Atmosphere Credit 1
SSN006: Advanced Modeling Techniques for HVAC Systems

Load Calculation for Commercial Buildings
SSN001

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Energy Simulation for Commercial Buildings  
*SSN002*

This course focuses on the process required to perform whole building energy simulations and operating cost calculations using energy calculation software. To receive a certificate, students must complete workshops involving in-depth understanding and hands-on modeling of simulation weather data, energy profiles, air systems, plant performance and utility rates. The class manual distributed to each student includes the detailed workshops which also include boiler, chiller, cooling tower, and air system configuration examples. Students who complete this course are able to perform energy simulations and operating cost analysis for commercial building systems.

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Block Load Basic Training  
*SSN003*

Hands-on session covering the basic operation of the Block Load Program. Each student will learn how to use the program by completing several simple project exercises, including definition and input of design weather data, construction materials and HVAC system parameters, interpretation of load calculation reports, and how to determine HVAC equipment size.

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Engineering Economic Analysis  
*SSN004*

Hands-on session covering the basic operation of the Engineering Economic Analysis program. This session is devoted to comparing the lifecycle economics of alternative designs for commercial HVAC systems. Attendees will learn how to apply the program for four types of economic analysis - (1) simple payback, (2) simple cash flow, (3) private sector lifecycle, (4) public sector lifecycle.

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Energy Modeling for LEED® Energy & Atmosphere Credit 1  
*SSN005*

This intense 1-day class focuses on the LEED® EA credit 1, Optimize Energy Performance process utilizing energy calculation software. Advanced simulation techniques are applied to the Performance Rating Method for whole building energy simulation per ASHRAE/IESNA Standard 90.1 requirements. Training covers in-depth, hands-on application of baseline and proposed building energy analysis and includes development of creative HVAC system alternatives for more LEED-Building Design & Construction points including the 2009 LEED requirements. Students who complete this course have the ability to run simulation software for analyzing baseline versus proposed building models for LEED Energy & Atmosphere Credit 1 Optimize Energy Performance.

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Advanced Modeling Techniques for HVAC Systems  
*SSN006*

In this full-day workshop-based class, students configure a series of advanced modeling scenarios for HVAC systems. Included are workshops covering the process of eliminating LEED unmet hours, optimizing the ventilation system design for a multiple-zone application using the ASHRAE Standard 62.1 Ventilation Rate Procedure, configuring a 100% OA (DOAS) VAV air system for a laboratory, a 100% OA VAV air system, a stand-alone constant volume 100% OA system, and new VRF system modeling. Also included are workshops on modeling of an air system that preheats with waste heat, heating systems with passive cooling, and a common boiler serving both domestic hot water and perimeter heating. Finally, workshops that cover merging collaborative projects, configuring an unconditioned space for LEED, enhancing productivity with computer Wizards, and modeling district heating and cooling for LEED EA Credit-1 analysis are also included.

Students who complete this course have the ability to configure and model all the advanced HVAC scenarios mentioned here utilizing computer simulation software.

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Network Controls Training

Controls Curriculum Track

Optimize the performance of your Carrier CCN or i-Vu control systems with Carrier University training classes

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<td>Control Systems</td>
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Introduction to BAS (Building Automation Systems)

**ECS 101**

This course is designed to provide a fundamental knowledge of the controls and control strategies used in comfort HVAC systems. The course is intended for engineers, entry-level technicians, and owners wishing to gain a better understanding of control theory and BAS control systems. The course starts by introducing the basic concepts of control and the vocabulary necessary to understand HVAC controls used in the designing of HVAC systems. This will take the student through the basic elements and building blocks of HVAC controls and show how comfort control systems create the desired equipment responses for maintaining room environmental condition set points. Students learn about what DDC Controllers are, what a Sequence of Operation is, and the importance of a Sequence of Operations. Class discussions will include the various temperature control strategies and HVAC systems that can be employed to maximize comfort provided to the building occupants. You will be exposed to the different types of controls and BAS control networks being installed and the basic concepts of control interoperability. The four key management methods available through BAS control networks will be addressed and students will be shown how to specify network configuration and functionality. At the conclusion of this class, students will be better able to discuss and specify BAS control systems. This class is a combination of classroom training and includes several workshops allowing students to demonstrate the concepts covered in class.

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Introduction to Carrier Network Controls

**ECS 111**

This is a comprehensive introductory course that provides entry-level as well as the experienced controls technician with the skills necessary to install, interface with, and operate a Carrier Comfort Network (CCN). The course begins with a review of basic control theory followed by a discussion of the standard algorithms used to control typical HVAC systems. Network configuration options and requirements, CCN architecture and standard communications protocol will also be covered in detail. Students are then introduced to the CCN family of stand-alone and networked controllers, learn their function within the network and how they are wired. The handheld System Pilot as well as Network Service Tool V software will be discussed in how to adjust set point tables and occupancy schedules and monitor algorithm performance. The i-Vu 6.0 web-based interface will be used as a part of this class. The class is a combination of classroom and simulator exercises. Students must furnish their own computer with the required software loaded before class. The information learned in this class provides students the tools and knowledge to install and maintain Carrier CCN systems quicker and operate them more efficiently.

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CC6400 Comfort Controller
ECS 315

Many commercial buildings use multiple units which owners wish to interface and they may also wish to provide the ability to control other building elements. Carrier’s Comfort Controller provides the device allowing contractors this interface on Carrier CCN systems. This training class is intended for control contractors who have a working knowledge of CCN Comfort Network. The skills taught allow the more advanced control technician to apply Carrier’s field programmable controller, the Comfort Controller 6400 (CC6400 and CC1600 controller) in commercial projects requiring networking functionality. This class gives the participant the knowledge to cost-effectively apply networking controls to ancillary HVAC devices like pumps, boilers, loop valves, cooling towers, tower bypass valves, exhaust fans and lighting controls, for example.

The course reviews basic control theory, defining input and output points, and includes a comprehensive discussion of the standard algorithms in the Carrier Comfort Controller. Students spend over 50% of the class using the Network Service Tool V in exercises to develop points, and create set point tables, occupancy tables and the associated algorithms. At the end of the class a student will be able to set up a points list, configure controller dip switches, develop programs and download them to the controller and test its operation. This course is a great way for a controls contractor to learn how to use the Comfort Controller to build his controls business.

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Best ++ Programming
ECS 900

This class is intended for the controls contractor or technician who has completed the ECS315 class and wishes to apply the Carrier Comfort Controller in custom applications. This course covers Carrier’s customized controller programming language called BEST++. The class addresses code writing and the “object oriented” programming methods of the Best++ in developing customized programs. Students will learn the skills necessary to modify or augment Carrier’s standard HVAC algorithms, modify set point tables, occupancy tables and associated algorithm parameters. These skills allow the student to develop a custom program to control loop pumping systems, boiler systems, loop valves, cooling towers, cooling tower bypass, exhaust fans, lighting, etc.

Students spend over 75% of the class time working with programs on CC6400 controllers through Network Service Tool V. Exercises include actually writing a custom program, compiling the program, downloading a program, uploading a program and debugging a program. The skills from this class give the controls contractor the skills and knowledge to apply the Carrier Comfort Controller to provide highly flexible solutions to their customers.

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Introduction to i-Vu Open Control Systems
ECS 121

This is a comprehensive introductory course that provides entry-level as well as the experienced controls technicians with the skills necessary to install, interface and operate Carrier’s i-Vu Open (6.0) BACnet DDC control system. The course begins with a review of basic digital control theory followed by a discussion of the standard algorithms used to control typical HVAC systems. MS/TP Network configuration options and requirements, Open systems architecture and standard communications protocols will also be covered. Students are introduced to Carrier’s family of native BACnet, stand-alone and networkable controllers, and learn their function, application, installation, and wiring within the i-Vu Open Control system. The i-Vu 6.0 Tech Tools software will be discussed and application will be introduced to the student. The i-Vu User interface will be used to interface with selected training simulators to alter set point tables and occupancy schedules and monitor algorithm performance and operation. The class is a combination of 50% classroom and 50% simulator exercises. The information learned in this class provides students the tools and knowledge to install and maintain Carrier i-Vu Open (6.0) Control systems quicker and operate them more efficiently.

This program does not qualify as a part of Controls Expert Certification.

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Carrier Controls Expert—Comfort System (CS) Open
CCE TIER 1 (CS)

This CCS course is the first in the Control Expert Training Series. This course will provide a technician the necessary skills to design, install, commission and troubleshoot Carrier’s i-Vu Open Comfort System tier products, the i-Vu Open network, and the i-Vu Open tools. This course is exclusive to registered Carrier Controls Expert Offices. For more information on the Carrier Controls Expert Program, please contact your local Carrier Controls sales representative or visit www.carrier.com/controls-experts.

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Carrier Controls Expert—i-Vu System (IS) Open CCE TIER 2 (IS)

This CCE course is the second in the Controls Expert Training Series. This course will provide a technician the necessary skills to design, install, commission and troubleshoot Carrier's i-Vu Open i-Vu System tier products as well as the i-Vu Web front end. This course is exclusive to registered Carrier Controls Expert Offices. For more information on the Carrier Controls Expert Program, please contact your local Carrier Controls sales representative or visit www.carrier.com/controls-experts.

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Carrier Controls Expert—Encompass System (ES) SNAP Custom Programming CCE TIER 3 (ES1) SNAP

The ES1 Custom Programming course is the third in the Controls Expert Training Series. This course will provide a technician the necessary skills to develop custom application programs using Carrier's SNAP custom programming tool for use with Carrier's i-Vu Open general purpose controllers. This course is exclusive to registered Carrier Controls Expert Offices. For more information on the Carrier Controls Expert Program, please contact your local Carrier Controls sales representative or visit www.carrier.com/controls-experts.

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Carrier Controls Expert—Encompass System (ES) i-Vu Pro Advanced CCE TIER 3 (ES2) i-Vu PRO

The ES2 i-Vu Pro Advanced course is the fourth in the Controls Expert Training Series. This course will provide a technician the necessary skills to install, commission and support Carrier's i-Vu Open Pro user interface solution. This course is exclusive to registered Carrier Controls Expert Offices. For more information on the Carrier Controls Expert Program, please contact your local Carrier Controls sales representative or visit www.carrier.com/controls-experts.

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Carrier Controls Expert—Encompass System (ES) ChillerVu CCE TIER 3 (ES3) ChillerVu

The ES3 ChillerVu course is an elective in the Controls Expert Training Series. This course will provide a technician the necessary skills to install, commission and support Carrier's ChillerVu plant control solution. This course is exclusive to registered Carrier Controls Expert Offices. For more information on the Carrier Controls Expert Program, please contact your local Carrier Controls sales representative or visit www.carrier.com/controls-experts.

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Carrier Controls Expert—Encompass System (ES) Third Party Integration into the i-Vu Web CCE TIER 3 (ES4) TPI

The ES4 Third Party Integration course is the fifth in the Controls Expert Training Series. This course will provide a technician the necessary skills to develop custom third party integration programs using Carrier's SNAP custom programming tool in order to integrate third party BACnet, Modbus or LON products into Carrier's i-Vu Web and i-Vu Open System. This course is exclusive to registered Carrier Controls Expert Offices. For more information on the Carrier Controls Expert Program, please contact your local Carrier Controls sales representative or visit www.carrier.com/controls-experts.

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Servicing heating and air conditioning systems requires a solid knowledge in the fundamental principles of air conditioning system operation. This online training series provides the background to understand both the theory and function of components used in heating and air conditioning systems. The General Training Air Conditioning series is in two sections; GTAC1 covers the theory and fundamental concepts and GTAC2 covers more advanced topics and basic troubleshooting skills. These modules are presented in simple language and concentrate on presenting the concepts in ways that can be easily understood by people new to the industry. After completing these modules, a student should possess the understanding of the concepts behind the air conditioning process, the types of systems and components, and basic troubleshooting techniques. Each module is self-paced and contains a quiz and final exam for the section, each with reference to the appropriate section of the module, allowing students to evaluate their understanding of the concepts presented.

GTAC1 Air Conditioning Fundamentals

Introduction to Air Conditioning
OLGTAC11
This module is a basic introduction to basic concepts behind the air conditioning process and assumes no previous knowledge of the subject matter. The module explains HVAC terminology and basic concepts of heat flow as applied in HVAC.

Temperature and Pressure
OLGTAC12
The second module covers heat transfer and temperature/pressure relationships. It also introduces the Ph (pressure enthalpy) chart which provides a good way to visualize the air conditioning process.

The Refrigeration Cycle
OLGTAC13
Module 3 introduces the function of major components and shows how these components work together to constitute the mechanical refrigeration system.
This fourth module describes various types of HVAC systems. In addition it discusses the compressor, condenser and evaporator performance curves.

Module 5 covers the basic types of compressors’ operation and introduces the different types, stressing their construction, function, and capacity.

In module 6 operation of condensers within the refrigeration system is introduced. Also covered in this module is a discussion about condenser capacity and how condenser problems relate to system troubleshooting.

Module 7 studies the basic evaporation process. Particular attention is paid in this module to the process’s relationship to the Ph chart and identifying evaporator problems.

Module 8 covers the specifics of modulating and fixed orifice refrigerant metering control. The module discusses the expansion process and superheat control within the refrigeration cycle.

In module 9 the operation and function of basic switches and loads in control and power circuits are described. Also covered are the various refrigerant flow controls.

Module 10 explains many of the refrigerant system options and accessories. Benefits of these options in terms of enhanced system operation, ease of installation and servicing, and user convenience are stressed.

This class is the complete 10 modules and includes a mid-term test and a comprehensive final exam.
GTAC 2 Air Conditioning (Applied)

Refrigerant Characteristics
OLGTAC21
This module discusses refrigerant types, characteristics, and oil compatibility of pure azeotropes, and zeotrope blends. It focuses on proper application and safe handling for new, replacement refrigerants used in air conditioning and refrigeration systems.

Refrigerant Oils
OLGTAC22
The second module covers oils used in air conditioning systems and how they are properly applied. The module also includes a discussion on the compatibility of oils with new, replacement refrigerants and changeout procedures.

Refrigerant Piping
OLGTAC23
This module familiarizes you with enough detail to spot and modify obvious field piping errors. Topics covered are piping requirements, sizing, insulation, and support and piping loops.

System Dehydration
OLGTAC24
This fourth module discusses moisture problems and their effect on air conditioning systems, and the importance of moisture elimination during evacuation.

Charging, Recovery, Recycling and Reclamation
OLGTAC25
Explained in this module is how to charge, recover and recycle traditional and replacement halocarbon refrigerants. The module also focuses on tools and equipment used in performing these procedures.

Installation Procedures
OLGTAC26
In module 6 all facets of refrigeration system installation are covered including planning, piping, brazing, wiring, pump down, prestart checks, and startup and safety essentials.

Heat Pumps
OLGTAC27
Module 7 covers the overall concept of the heat pump, its operation, benefits and disadvantages, operating economics, servicing concerns and how water-source heat pumps are used for heat reclaim in commercial buildings.

Part Load
OLGTAC28
Operating problems often show up at part load rather than at full capacity. This module explains how these operating problems impact the refrigeration cycle.

Troubleshooting
OLGTAC29
This ninth module introduces basic refrigeration system troubleshooting procedures. Study includes diagnostic tools along with troubleshooting, logic, information, and charts.

TIME COST
$25 PER MODULE
IACET Yes NATE Yes FAD Yes
2 hrs

General Training Air Conditioning
OLGTAC20
This class is the complete 9 modules and includes a mid-term test and a comprehensive final exam.

TIME COST
$200 PER MODULE
IACET Yes NATE Yes FAD Yes
18 hrs

CLASS TIME APPROX. 2 HRS, ACCESS IS AVAILABLE FOR 4 WEEKS AFTER FIRST LOG-IN.

CLASS TIME APPROX. 18 HRS, ACCESS IS AVAILABLE FOR 6 WEEKS AFTER FIRST LOG-IN.
Servicing heating and air conditioning systems requires more than knowledge of mechanical system operation but also a very good understanding of electrical circuits and operation. This online training series provides the background to understand electrical circuits, the components used in them and how they function in heating and air conditioning systems. These modules are presented in simple language and concentrate on presenting the concepts in ways that can be easily understood by people new to the industry. After completing these modules, a student should possess the understanding of electrical circuits in air conditioning systems and basic electrical troubleshooting techniques. Each module is self-paced and contains a quiz and final exam for the section, each with reference to the appropriate section of the module, allowing students to evaluate their understanding of the concepts presented.

GTE Electricity

Introduction to Electricity
OLGTE21
Module 1 introduces the student to electrical terminology and basic concepts of electricity. This module is appropriate to students with limited knowledge of electricity and covers Ohm’s Law, power, series, and parallel circuits.

Electrical Components and Their Symbols
OLGTE22
Module 2 introduces basic AC, magnetism, and common electrical components. It begins the coverage of wiring diagrams and their symbols by constructing a very basic circuit diagram.

Wiring Diagrams
OLGTE23
Module 3 discusses safety practices and introduces additional electrical components. A step-by-step construction of a simplified wiring diagram, covering power, control, and load circuits for a typical packaged air conditioner with electric heat, is developed.

Wiring Diagram Exercises
OLGTE24
The fourth module covers step-by-step construction of a wiring diagram for a heat pump to teach more advanced diagram-reading skills and control circuit concepts.

Electric Meters and Their Uses
OLGTE25
Module 5 discusses the construction of various types of meters and explains their applications. Sample problems illustrate the use of meters in electrical troubleshooting and testing.

Alternating Current Fundamentals
OLGTE26
The sixth module expands on basic AC concepts covered in modules 1 and 2 as the basis for understanding AC motors and AC power. Also covered are the basic concepts of motors and generators, capacitors, phase shift, and power distribution systems.

Motor Fundamentals and Motor Protection
OLGTE27
Module 7 covers basic theory and operation of common single-phase and three-phase AC induction motors, including motor starting circuits. The module also describes the various types of protective devices used with motors.

Electronic Devices and Circuits
OLGTE28
Module 8 discusses basic concepts, packaging, and troubleshooting of electronic circuits used in comfort air conditioning. The module covers semiconductors, timing and sensing devices, and the use of microprocessor controls in comfort applications.

Electrical Troubleshooting
OLGTE29
Module 9 describes and illustrates techniques for troubleshooting electrical and electronic circuits with a focus on control circuits and motors.

Time Cost
2 hrs $25 IACET Yes FAD Yes NATE Yes
Class time approx. 2 hrs, access is available for 4 weeks after first log-in.

General Training Electricity (Fundamentals)
OLGTE20
This class is the complete 9 modules and includes a mid-term test and a comprehensive final exam.

Time Cost
18 hrs $200 IACET Yes FAD Yes NATE Yes
Class time approx. 18 hrs, access is available for 6 weeks after first log-in.
Online Basic Gas Heating Theory

The most popular form of heating in North America is gas. Servicing gas heating systems requires understanding the theory of operation and how the system components function to provide safe, economical comfort heating. This online training series provides the background to understand both the theory and function of components used in gas heating systems. These modules are presented in simple language and concentrate on presenting the concepts in ways that can be easily understood by people new to the industry. After completing these modules, a student should possess the understanding of the concepts behind systems which use gas heating, the types of systems and components, and basic troubleshooting techniques. Each module is self-paced and contains a quiz and final exam for the section, each with reference to the appropriate section of the module, allowing students to evaluate their understanding of the concepts presented.

GTH Heating

Introduction to Gas Heating
OLGTH21
This first module introduces students to four of eight foundation blocks of heating: 1) Heat; 2) Molecules, Heat and Temperature; 3) Heat Transfer; 4) Pressure.

Principles of Gas Combustion
OLGTH22
This second module introduces the remaining four foundation blocks of heating: 5) Gas Properties; 6) Combustion Theory; 7) Practical Combustion; and 8) Efficiency.

Gas Furnaces
OLGTH23
In this module students learn basic furnace design, gas system components, furnace controls, and system controls and components.

Gas Burners
OLGTH24
Module 4 expands on basic concepts from the first three modules and includes: theoretical flame characteristics; burner design; actual flame characteristics; combustion systems; and pilot burners.

Gas Controls
OLGTH25
This module focuses on the controlled combustion process: gas controls; manual and automatic valves; and gas regulators.

Gas Ignition Systems
OLGTH26
Module 6 explains the three types of ignition systems commonly used: standing pilot; re-ignition pilot; and direct burner ignition.

Gas Safety & Operating Controls
OLGTH27
This module covers basic theory and operation of common safety controls, operating controls, and system controls used in gas furnaces.

Furnace Installation Practices
OLGTH28
In module 8 students learn application principles: planning; designing; and selecting equipment, as well as proper gas-piping techniques and installation practices.

Ventilation & Combustion Air
OLGTH29
This module introduces terminology of Category I vent design basics, vent design and combustion air, as well as Category IV venting and combustion air.

Gas Troubleshooting
OLGTH210
Module 10 covers basic troubleshooting practices. Covers: basic adjustments; gas input; primary air; efficiency checks; furnace problems; how to identify and correct the operation and function of basic switches and loads.

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CLASS TIME APPROX. 2 HRS, ACCESS IS AVAILABLE FOR 4 WEEKS AFTER FIRST LOG-IN.
### General Training Heating
**OLGTH20**

This class is the complete 10 modules and includes a mid-term test and a comprehensive final exam.

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Class time approx. 20 hrs, access is available for 6 weeks after first log-in.

### NATE Core Preparation Course
**OL001 (ENGLISH ONLINE)**

Boost your score by as much as 10 POINTS! This online training is targeted at residential and light commercial service technicians who want to review topics that will be covered in the Core exam. This refresher course represents over six hours of training and practice questions that can be reviewed repeatedly over a two-week period. A final exam measures your readiness for the NATE Core exam. Topics include: HVAC, Electricity, Motors and Customer Relations. Study guides in PDF format are included with course registration.

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Class time approx. 6 hrs, access is available for 2 weeks after first log-in.
Basic Apprentice Startup and Installation
SER 400

Designed for the new hire into the HVAC residential light commercial installation and startup business, this course was specifically developed for the person with minimum training or field experience. It is intended to quickly help a new hire become a useful and profitable member of the installation team. The course not only provides practical hands-on training, but will show the students the right way to install and start residential and light commercial equipment. This will help insure proper system operation with top efficiency, promote customer satisfaction, and eliminate costly callbacks. This course can also provide the first stepping stone in training for an installer, who is being groomed to advance towards a service technician position. This 4-day course splits time in the classroom with hands-on training. Skills covered include brazing, refrigerant recovery and charging and proper use of common HVAC troubleshooting tools. The class is 30% to 40% lab time. Upon request the EPA 508 certification can be held after class at a slight additional cost. This certification is required to handle refrigerants.

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HVAC Electrical Pro-Troubleshooting
SER027

A primary skill for HVAC technicians is the ability to troubleshoot electrical circuit problems. This course teaches the fundamental and advanced skills of troubleshooting residential and commercial HVAC electrical system problems. In this course, technicians learn and practice proven diagnostic techniques that they can apply immediately, back on the job. The goal is to provide technicians with both the skills and confidence to tackle any control or power electrical system malfunction. Emphasis is on using a process to rapidly discover failed components and prevent repeat failures through root cause determination. Following this logical, systematic procedure for troubleshooting electrical systems makes the job much less intimidating. This course can be taken as a stand-alone seminar, or can be taken in conjunction with HVAC Mechanical Pro-Troubleshooting. This is not a course for a technician just entering the HVAC field, and an understanding of basic electrical theory is assumed. This class is a combination of classroom activity and in-lab exercises using testing and servicing tools, with 30% to 40% lab time. Upon request the EPA 508 certification can be held after class at a slight additional cost. This certification is required to handle refrigerants.

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Heat Pumps Installation and Service
SER190

Rising energy prices have increased interest in air-to-air heat pumps even in climate zones not normally considered for heat pump applications. Technicians in many climate zones now need to have a good working knowledge of the operation and troubleshooting of heat pump units. This training course covers residential and commercial split system and packaged air-to-air heat pumps including dual fuel units. Students will learn how to troubleshoot, service and maintain heat pumps fast and accurately. Classroom sessions discuss the refrigeration, air, and electrical systems. Newly acquired skills are tested on operating equipment in the lab. Topics covered include heat pump operation, defrost operation and troubleshooting, supplemental heating, dual fuel setup and operation, operation and troubleshooting of variable speed compressor and indoor fan motors, and metering devices including electronic expansion valves. This class is a mix of classroom training and lab exercises on actual residential split system and commercial rooftop units, with 30% to 40% lab time.

Gas Heating Installation and Service
SER 200

In North America gas heating furnaces are the most common type of residential and light commercial heating system. In this course, you’ll learn how to install, troubleshoot, service, and maintain gas furnaces—professionally, accurately, and quickly. The equipment covered in this class ranges from standard efficiency furnaces to the latest multi-poise condensing furnaces with modulating gas valves, variable speed motors, microprocessor controls, electronic thermostats, and direct ignition burners with flame rectification proving circuits. Classroom sessions cover: gas heating fundamentals, types of gas heating systems, furnace construction, operating components and safety controls, furnace combustion and venting air requirements, installation rules and gas pipe sizing, determining proper size for vent pipe and venting concerns, conversion of natural gas to LP adjustments for altitude, accessories (such as humidifiers and electronic air cleaners), reading electrical schematics and interpretation of various heating electrical circuits. Classroom instruction is reinforced with a number of lab troubleshooting exercises on operating rooftops and residential furnaces, with 30% to 40% lab time.

NEW Air System Measurement, Testing and Verification
SER 300

Comfort and performance issues are often the result of improper airflow. Airflow testing is the primary performance indicator of any HVAC system and must be completed before all other service procedures can begin. Without verification of airflow throughout the entire system, it’s impossible to effectively test the heating and refrigeration performance or assure zone-by-zone airflow. Proper assessment of required outside ventilation air supplied to the zone(s) through air economizers in systems such as VAV (variable air volume), CV (constant volume) and SZVAV (single zone VAV systems) is essential to code compliance and zone comfort. Just because the airflow of the supply air blower may be adequate, you cannot accept this airflow is being effectively dispersed throughout the building and the various comfort zones. The primary purpose of air delivery systems is to “deliver comfort and proper ventilation air” and neither of these air properties can be assured unless zone-by-zone airflow is tested, measured, and verified to match the zone design calculations. If the proper airflow doesn’t match or meet the needs of the occupied comfort zone, there’s no way the ventilation and load requirements can maintain the occupants’ comfort. “Air System Measurement, Testing and Verification” is as important as any step a technician performs in commissioning or troubleshooting a system.

This course is an in-depth analysis of the principles that impact airflow including air properties; fan, air terminal, and diffuser performance; airflow measurement and testing instrumentation. Also covered is how to determine proper ventilation in compliance with code requirements and determine if it is being delivered to the zone. Use of control systems to properly set up various VAV terminals including single duct and fan-powered pressure dependent and pressure independent systems is covered. At the end of this course a technician will be capable of using typical field measurement tools to commission and troubleshoot air systems. Over 50% of this class involves exercises using working units and typical field instrumentation.
## Technician Equipment Training

### Single Zone Rooftop Units
**SER143**

The Single Zone Rooftop service course is for technicians servicing Carrier Single Zone rooftop units. This training course covers commercial rooftop units 25 tons and less, and deals with the industry’s most common packaged products. The class provides detailed training intended to improve the troubleshooting skills and product knowledge of HVAC technicians. A variety of rooftop units and simulators are used to provide training exercises for wiring diagram interpretation, compressor troubleshooting, and control/sensor troubleshooting. The course specifically covers Carrier rooftop units produced over the last 20 years, however, many procedures covered can be universally applied to all makes of rooftop units. Specific models covered include 48/50 T, H, P, L and K series units under 25 tons. These models cover electric/electric, gas/electric, heat pump, and dual fuel units primarily as applied in constant volume applications. At the end of this course a student will be better able to quickly diagnose and repair refrigeration, gas heating, heat pump, economizer, air side and system operation problems on these units. The class addresses electromechanical, ComfortLink, PremierLink™, and the RTU-OPEN™ Control systems and their operation. The class also addresses staged air volume, ECM and VFD applications, Humidi-MiZer Adaptive dehumidification system, EnergyX heat recovery, and various economizer options used with these units. This class is a mix of classroom training and in-lab exercises on actual rooftop units. Over 30% of the class involves lab exercises on actual operating rooftop units.

<table>
<thead>
<tr>
<th>DAYS</th>
<th>COST</th>
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### Applied Rooftop Units
**SER147**

The Packaged Variable Volume Commercial Rooftop service course is for technicians servicing Carrier Variable Volume-Zoned rooftop units. This training course on commercial rooftop units deals with the industry’s most common packaged product in the over 20 ton market. The class provides detailed training intended to improve the troubleshooting skills and product knowledge of HVAC technicians. This course covers the Carrier A, Z, P and N Series Rooftops over 25 tons with ComfortLink Controls. This 3-day training session is conducted utilizing classroom presentations and supplemented with simulator exercises on actual unit control panels. Students will learn how to use the system controls and the latest Controls & Troubleshooting documents to quickly determine and repair system faults. The simulator exercises cover the three modes of operation: Cooling, Heating and Ventilation. There are over 16 electrical faults built in each simulator, allowing the technician to experience the most common problems encountered in the field. Technicians work their way through the panel’s bug list to ensure a hands-on comfort level with each unit type. Classroom activities include a detailed coverage of installation, startup, maintenance, and troubleshooting of the refrigeration, heating, economizer, and system option. Over 30% of the class involves lab exercises on actual unit control panels.

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<tr>
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<th>COST</th>
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Centrifugal Chiller Fundamentals
SER120
Centrifugal chillers represent a significant HVAC investment for the building owner, and each type of machine requires specific operating, servicing and maintenance practices to protect the investment. This course is intended for service technicians and operators of Carrier 19 series centrifugal chillers. The course covers fundamental principles of centrifugal chillers with in-depth coverage of the operation and service techniques associated with most Carrier centrifugal chillers produced over the last 30 years. Carrier chillers modeled include 19D low-pressure chillers and 19E, F, 19XL, XR and 19XRV high-pressure chillers. Participants learn how to operate, maintain, troubleshoot, and service both the low- and high-pressure machines (including PIC controls). Studies include: centrifugal refrigeration cycles, compressor theory, lubrication cycles, purge operation, refrigerants, heat exchangers, and heat transfer. The course also covers troubleshooting techniques and equipment needed to record and analyze machine temperatures and pressures; performance using heat exchanger approaches; waterside flow rate analysis; maintenance requirements; and logging machine data. This course is mostly classroom instruction and includes numerous exercises using the classroom information to analyze performance. Successful completion of this course is required in order to attend the SER 130 Centrifugal Disassembly and Reassembly course.

Efficient operation of air- and water-cooled chiller systems requires a thorough understanding of their operation and service procedures. Many of these chillers use scroll or screw compression technology. In this class the service technician will learn how to best operate, maintain, troubleshoot, and service Carrier’s complete line of scroll and screw 30 Series air-cooled and water-cooled chillers from the past 20 years. Models covered include the 30GX/HX, RA/RB/RAP, and XA/XW/XV. Studies include chiller refrigeration cycle, compressor theory, cooler heat transfer, and water- and air-cooled condensers. You’ll learn how to analyze performance by recording and analyzing refrigerant and water pressures and temperatures and calculating GPM flows. We also cover refrigerant controls, adjustments, charging, capacity control and capacity testing, and operation and troubleshooting of the electrical system, including timers, temperature controllers, and operating and safety controls. This class is mostly done in the classroom; however, several lab exercises are done using the control simulators, allowing students to have hands-on knowledge of chiller control operation. The skills learned in this class will allow operators to run machines more efficiently and service technicians to reduce service time and callbacks.

Centrifugal Disassembly and Reassembly
SER130
This class is intended to be the follow-up class to SER 120, Centrifugal Chiller Fundamentals, and is designed to teach experienced service mechanics how to properly disassemble both low- and high-pressure centrifugal compressors, including Models 19D, 19E / F and 19XL, XR, and XRV. Techniques and procedures for using precision instruments are taught for determining clearances, fits, and tolerances of various bearings, seals and components. Students also review compressor lubrication and motor cooling. This class is almost completely a lab course, and students work in teams to disassemble, adjust, and reassemble the various chiller models. Because this course is labor-oriented with enhanced student/instructor contact, attendance is limited and early registration is recommended.

30 Series Screw and Scroll Chiller Fundamentals
SER270

Centrifugal Chiller Fundamentals, and is designed to teach experienced service mechanics how to properly disassemble both low- and high-pressure centrifugal compressors, including Models 19D, 19E / F and 19XL, XR, and XRV. Techniques and procedures for using precision instruments are taught for determining clearances, fits, and tolerances of various bearings, seals and components. Students also review compressor lubrication and motor cooling. This class is almost completely a lab course, and students work in teams to disassemble, adjust, and reassemble the various chiller models. Because this course is labor-oriented with enhanced student/instructor contact, attendance is limited and early registration is recommended.

23XRV Liquid Screw Chiller Service and Operator
SER275
This course is targeted at service technicians and facility managers who operate or service Carrier model 23XR/XRV water-cooled screw chillers. This class will cover the chiller refrigeration cycle, compressor theory, drive theory, cooler heat transfer, and water-cooled condensers. Operation and function of the compressors, muffler, condenser, coolers, economizers, metering devices, oil concentrator and accessories are covered. You will learn how to analyze performance by recording and analyzing refrigerant and water pressures and temperatures. Service technicians will be able to distinguish between chiller and system problems and to quickly diagnose problems using service logs. The class also covers the unit controls and how to set up and adjust the controls for optimum system performance. In addition, recommended pre-start and startup procedures, and operational and field issues will be covered. These compressors have very few tear-down procedures; these procedures will be covered but are not demonstrated. The class consists of classroom instruction with a number of exercises to develop the skills taught in the class and some lab exercises using control simulators developing a working knowledge of the control system operation.

### Technician Equipment Training (continued)

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<th>Course Code</th>
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Carrier University Airflow Calculator

Carrier University Airflow Calculator app will guide the user through the airflow measurement process and automatically calculate airflow in a round or square duct. The user can use a pitot tube or anemometer. By entering in the duct size, the program will automatically calculate the number of probe holes and locations. After entering the probe measurements, the airflow is calculated and saved. A step-by-step process and video are provided to help anyone learn to take accurate airflow readings.

Features

- Select measurement unit - Anemometer or Pitot tube
- Select Duct Type
- Enter Job Site name, Duct diameter (in inches) and other related details
- Enter Hole readings
- Calculate Airflow in CFM
- Email the result
- Search for past recordings

To find out about a FREE download, go to Carrier University link to apps.