Customer Training Catalog

2018

Johnson Controls

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Course Details and Information

About the Johnson Controls Training Institute

Since 1947, the Johnson Controls Training Institute has been helping people succeed at creating and managing quality building environments. The Training Institute partners with engineering schools, technical colleges, and experts in the building environments industry. This allows us to provide high-quality learning experiences that reflect both the current state of the industry today and the direction its heading in the future.

Our curriculum has been developed by professional instructors who are experienced in the building environments industry. Their extensive real-world experience and ability to share their knowledge in a structured format assures you an enlightening and productive educational experience.

- Learn from Certified Instructors* with years of industry experience
- Experiment in our labs, using specially designed equipment simulators
- Find the learning opportunities
- Expand your knowledge in industry topics such as:
  - Building Automation Systems
  - Energy Management
  - Heating, Ventilating, and Air Conditioning Systems
  - Preventative Maintenance
  - Automated Building Controls

Because your goal is to apply what you've learned, our state-of-the-art facilities include fully equipped labs for hands-on exercises. Portable equipment simulators enable the Training Institute to bring many of its courses to your location, yet still enable you to practice what you've learned without jeopardizing building operations.

Our comprehensive and cost-effective programs are designed for anyone who needs a working knowledge of environmental systems, including:

- Building Owners
- Building Managers
- Engineers
- Operators
- Maintenance Technicians
- Property Managers

**Johnson Controls Training Institute instructors are certified on the technical and application objectives of each course, while referencing the core instructor competencies summarized by the International Board of Standards for Training, Performance, and Instruction (IBSTPI) Instructor Competencies – The Standards (Volume 1) ©2003, all rights reserved.*

TRAINING OPTIONS TO MEET YOUR NEEDS

Our learning opportunities are designed to provide you with the knowledge and skills necessary to effectively and efficiently operate your building's systems. By using your newly acquired abilities, you can maximize the potential of your building systems and increase your return on investment. To help you take advantage of the benefits of our training, we offer several ways to approach our courses. You can select from our:

Training Institute Courses (Scheduled)

Regularly scheduled courses with both a classroom and lab component are conducted at our ten Johnson Controls Training Institute locations. During class you will be using an iPad® to take notes and highlight the material. When class ends you will take your notes and course material with you on a USB Drive. The descriptions of the regularly scheduled courses begin on **page 13**. Refer to the Class Schedule available at **www.johnsoncontrols.com/institute** for the dates, locations, and prices of these courses. Note: No audio/visual recording equipment is allowed.

Instructor-Led Distance Learning Courses and Learning Packages

Learn in the convenience of your own home, office, or work location using Johnson Controls instructor-led distance learning courses or learning packages. Learning packages include Interactive CD-ROMs, computer-based training programs, DVDs, and self-study workbooks offering flexible, effective, cost-efficient opportunities to build knowledge and skills. Our instructor-led distance learning courses and learning packages can be used as preparation for a course, to refresh skills, or to provide an effective learning alternative if attendance at a typical classroom course is impractical. The list of instructor-led distance learning courses are on **page 35** and information about our learning packages begins on **page 43**.

Courses Offered By Request Only

Some of our courses target a more specific audience and therefore, have lower demand. To continue to satisfy the needs of those who still occasionally need these courses, selected courses are only conducted upon request. These courses can be conducted at your site or at one of our ten Training Institute locations. For this reason, these courses are not included on the schedule. To inquiry about scheduling a course, contact the Learning Institute at 414-524-4286 or **cg-customer.registrar@jci.com**.

Onsite Learning Programs

Johnson Controls Training Institute can help you make the most of your investment in learning by bringing our instructors and classes to you or to the location of your choice. More and more companies are realizing the value of bringing training Onsite. Our onsite Courses can be the most efficient and cost-effective way to train as few as eight employees.

Onsite Courses offer a number of advantages:

- Smaller class size allows for more individualized attention
- Economical as one instructor travels instead of eight or more students
- Consistency among employees who learn together as a group

To ensure the success of an onsite Course, you provide:

- A minimum of eight students
- A suitable room for training

Johnson Controls Training Institute will provide:

- Specially designed portable equipment simulators and computers
- USB jump drives with course and reference material for all student

ENROLLMENT INFORMATION

ONLINE ENROLLMENT

To browse our catalog and enroll for our courses, please visit our website: www.jcitraininginstitute.com

For more information, call or fax:
414-524-4286 or 800-524-8540
877-403-6625 (fax)
Email: cg-customer.registrar@jci.com

Payment:
Payment can be made using Visa®, MasterCard® or American Express®.
All necessary course materials are included in the tuition listed in each course description.

Schedule of Classes

The 2018 schedule of classes is available at **www.johnsoncontrols.com/institute**. The schedule is subject to change.

Vouchers

Enjoy savings and flexibility by ordering a pack of vouchers good for any classes without enrolling specific students at this time. For ordering information, call 800-524-8540. (Vouchers cannot be used for course **#4720** Facility Explorer Supervisory Controllers Engineering/N4 Certification or **#1100** Verasys Engineering and Configuration.)

- A 10-pack of training vouchers is **$14,590**. Vouchers are good for two years from the date of purchase and must be used for regularly scheduled Training Institute classes.
- A 5-pack of training vouchers is **$7,735**. Vouchers are good for one year from the date of purchase and must be used for regularly scheduled Training Institute classes.
- The Personal Passport is valid for a specified individual for any three classes and is good for one year from the date of purchase. The Personal Passport is **$4,110**.

Substitutions and Cancellations

Circumstances may occur that could prevent you or your employee from attending a course for which you are enrolled. For this reason, we allow you to substitute another employee in their place at no additional fee. If no substitute student is available and you must cancel your enrollment, a refund will be issued by visiting **www.jcitraininginstitute.com** at least 14 days prior to the start of the course. If, however, you must cancel within 14 days of the start of the course, you will be liable for the entire course fee.

Johnson Controls reserves the right to cancel classes and assumes no liability for expenses. All registrants will be notified at least ten days before the start of class should a course be canceled.

Guarantee

We stand behind our courses with the following guarantee: If, by the midpoint of the course, you are not satisfied with the course you are taking, Johnson Controls Training Institute will refund your tuition fee in full, or give you credit toward another course or packaged training program.

TRAINING INSTITUTE LOCATIONS AND HOTELS

Students must call the hotels directly to make reservations. The Johnson Controls Training Institute rate must be requested. Be sure to ask about complimentary shuttle services to and from our learning centers. (These services are not available everywhere). Reservations made through a travel agency are not eligible for the discounted rate. Look for maps of the Training Institutes on the Johnson Controls website: **www.johnsoncontrols.com/institute**

Baltimore, Maryland

60 Loveton Circle, Sparks, MD 21152
Located in rural Baltimore County off of I-83 North, approximately 35 miles from Baltimore Washington International Airport.
Airport Code: BWI

Suggested Hotels

Embassy Suites
213 International Circle
Hunt Valley, MD 21030

Holiday Inn Express Hunt Valley
11200 York Road
Hunt Valley, MD 21030
410-527-1500

Residence Inn - Hunt Valley
45 Schilling Rd
Hunt Valley, MD 21031
410-527-2333

Greater Baltimore Convention and Visitor Bureau
www.baltimore.org
410-584-1400

Boston, Massachusetts

39 Salem Street, Lynnfield, MA 01940
Located approximately 12 miles from Boston's Logan International Airport.
Airport Code: BOS

Suggested Hotels

Four Points by Sheraton Wakefield Boston Hotel and Conference Center
1 Audubon Road
Wakefield, MA 01880
781-245-9300

Hampton Inn
59 Newberry Street (Route1)
Peabody, Ma 01960
978-536-2020

SpringHill Suites by Marriott
59 Newberry Street (Route1)
Peabody, Ma 01960
978-535-5000

Greater Boston Convention and Visitor's Bureau
www.bostonuse.com

The City Guide Salem, MA
www.salemweb.com

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Dallas, Texas

3021 West Bend Drive, Irving, TX 75063
Located 6 minutes from the Dallas Fort Worth International Airport.
Airport Code: DFW

Suggested Hotels

Element
3550 W. IH 635
Irving, TX 75063
972-929-9800

Holiday Inn Express & Suites
4550 W. John Carpenter Frwy
(Hwy 114) Irving, TX 75063
972-929-4499

Wingate by Wyndham
8220 Esters Boulevard
Irving, TX 75063
972-929-4600

Greater Dallas Convention and Visitor Bureau
www.dallascvb.com
214-571-1300

Houston, Texas,

10644 West Little York Road,
Houston, TX 77041
Located approximately 22 miles from the George Bush Intercontinental Airport and 27 miles from Houston/Hobby Airport.
Airport Codes: IAH and HOU

Suggested Hotels

Holiday Inn West - Westway Park
4606 Westway Park Blvd
Houston TX 77041
713-996-8200

La Quinta
9034 West Sam Houston Pkwy N
Houston, TX 77064
281-671-6016

Greater Houston Convention and Visitor's Bureau
www.visithoustontexas.com

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Indianapolis, Indiana

1255 North Senate Avenue,
Indianapolis, IN 46202
Located approximately 15 minutes from the Indianapolis International Airport.
Airport Codes: IND

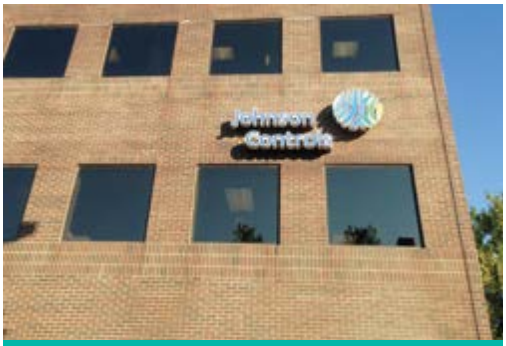
Suggested Hotels

Courtyard Marriott Indianapolis at the Capital
320 North Senate Ave
Indianapolis, IN 46204
317-684-7733

Hampton Inn Indianapolis Downtown
105 S Meridian St
Indianapolis, IN 46225
317-261-1200

Residence Inn Marriott Canal
350 West New York Street
Indianapolis, IN 46202
317-822-0840

Greater Indianapolis Convention and Visitor Bureau
www.visitindy.com



Louisville, Kentucky

9410 Bunsen Parkway, Suite 100,
Louisville, KY 40220
Located approximately 10 miles from Louisville International Airport.
Airport Codes: SDF

Suggested Hotels

Holiday Inn Louisville East – Hurstbourne
1325 South Hurstbourne Parkway
Louisville, KY 40220
502-426-2600

Hyatt Place – East
701 South Hurstbourne Parkway
Louisville, KY 40222
502-426-0119

Greater Louisville Convention and Visitor's Bureau
www.gotolouisville.com

TRAINING INSTITUTE LOCATIONS AND HOTELS

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Milwaukee, Wisconsin

514 N. Jefferson Street,
Milwaukee, WI 53202
Located in downtown Milwaukee, approximately 10 miles from General Mitchell International Airport.
Airport Codes: MKE

Suggested Hotels

Courtyard Marriott
300 West Michigan Street
Milwaukee, WI 53203
414-291-4122 / 888-811-8139

Hilton Garden Inn Milwaukee Downtown
611 N Broadway
Milwaukee, WI 53202
414-271-6611

Hilton – Milwaukee City Center
509 West Wisconsin Avenue
Milwaukee, WI 53203
414-271-7250 / 800-445-8667

Hotel InterContinental
139 East Kilbourn Avenue
Milwaukee, WI 53202
414-276-8686

Pfister Hotel
424 East Wisconsin Avenue
Milwaukee, WI 53202
414-273-8222 / 800-558-8222

Residence Inn Marriott
648 N. Plankinton Avenue
Milwaukee, WI 53203
414-224-7890

Greater Milwaukee Convention and Visitor Bureau
www.milwaukee.org
414-273-7222 / 800-231-0903

Phoenix, Arizona

Gateway Community College,
108 N. 40th Street, Phoenix, AZ 85034
Located about one mile north of the Phoenix Sky Harbor International Airport.
Airport Codes: PHX

Suggested Hotels

Crowne Plaza Phoenix
4300 East Washington Street
Phoenix, AZ 85034
602-273-7778

Hampton Inn
601 North 44th Street
Phoenix, AZ 85008
602-267-0606

Hilton Garden Inn
3838 East Van Buren Street
Phoenix, AZ 85008
602-306-2323

Holiday Inn and Suites – Phoenix Airport
3220 S. 48th Street
Phoenix, AZ 85040
480-543-1700

Greater Phoenix Convention and Visitor's Bureau
www.arizonaguide.com

TRAINING INSTITUTE LOCATIONS AND HOTELS

Students must call the hotels directly to make reservations. The Johnson Controls Training Institute rate must be requested. Be sure to ask about complimentary shuttle services to and from our learning centers. (These services are not available everywhere). Reservations made through a travel agency are not eligible for the discounted rate. Look for maps of the Training Institutes on the Johnson Controls website: **www.johnsoncontrols.com/institute**

Southern California

5770 Warland Drive, Cypress, CA 90630
Located approximately 9 miles from the Long Beach Airport, 20 miles from the John Wayne Airport, and 30 miles from the Los Angeles International Airport.
Airport Codes: SNA & LAX

Suggested Hotels

Ayres Hotel
12850 Seal Beach Boulevard
Seal Beach, CA 90740
800-653-3230

Courtyard Marriott
5865 Katella Avenue
Cypress, CA 90630
714-827-1010

Hyatt House
5905 Corporate Avenue
Cypress, CA 90630
714-828-4000

Marriott Residence Inn
4931 Katella Avenue
Los Alamitos, CA 90720
714-484-5700

Greater Los Angles Convention and Visitor Bureau
www.latourist.com
213-689-8822

Orange County Visitor Information
877-GO-ORANGE
www.anahiemoc.com

Tampa, Florida

3802 Sugar Palm Dr, Tampa FL 33619
Located 12 miles from the Tampa International Airport.
Airport Codes: TPA

Suggested Hotels

Hilton Garden Inn Tampa East/Brandon
10309 Highland Manor Drive
Tampa, FL 33610
813-626-6700

Residence Inn Tampa Sabal Park/Brandon
9719 Princess Palm Avenue
Tampa, FL 33619
813-627-8855

Staybridge Suites Tampa East Brandon
3624 North Falkenburg
Tampa, FL 33619
813-227-4004

Greater Tampa Convention and Visitor's Bureau
www.visittampabay.com

TRAINING INSTITUTE LOCATIONS AND HOTELS

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New Location! Shrewsbury, PA

5000 Renaissance Drive
New Freedom, PA 17349
Located 52 miles from the Baltimore Washington International Airport and 47 miles from the Harrisburg International Airport.
Airport Codes: BWI & MDT

Suggested Hotels

Shrewsbury Hampton by Hilton
1000 Far Hills Drive
New Freedom, PA 17349
717-235-9898

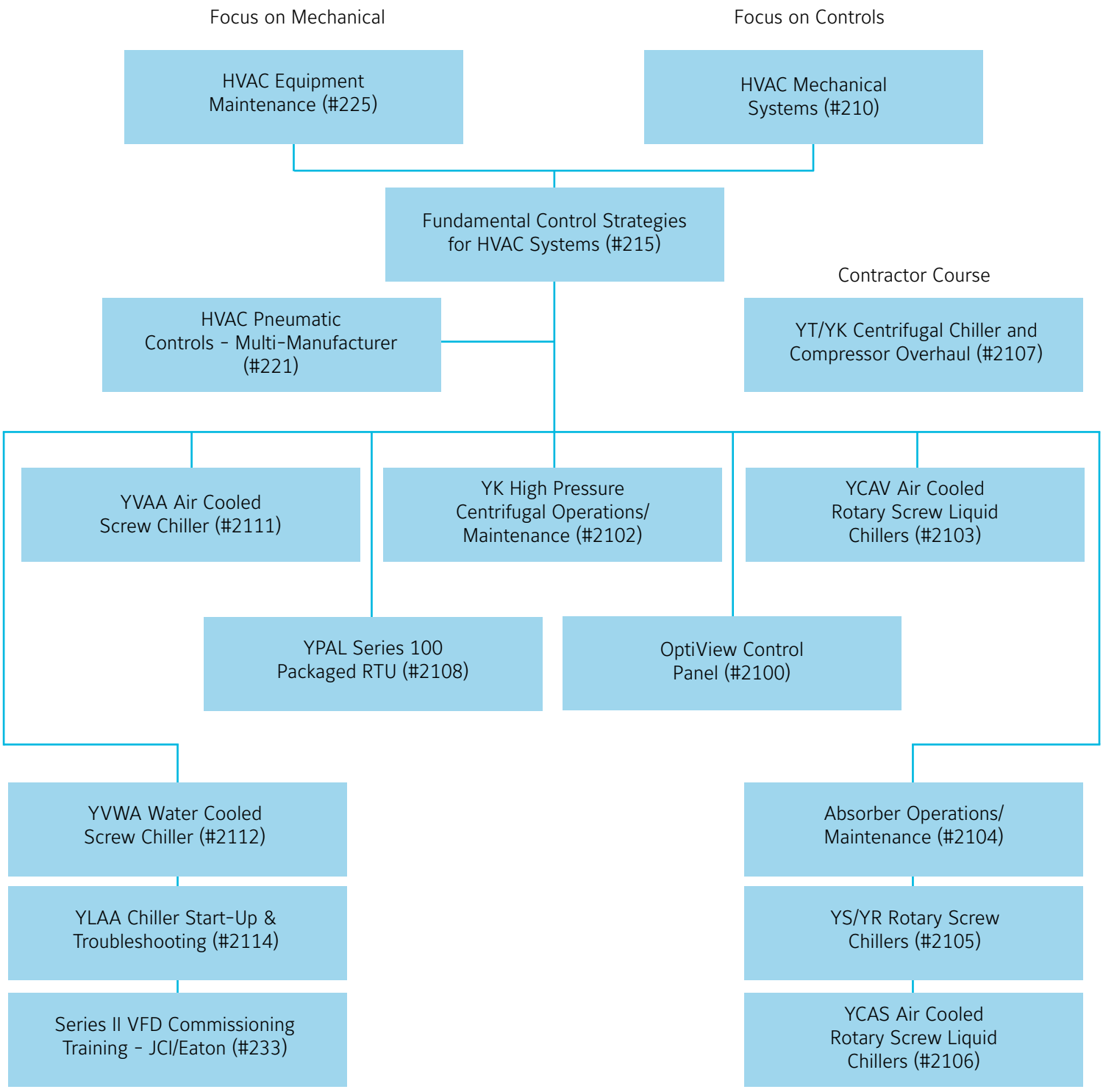
Holiday Inn Express & Suites York
140 Leader Heights Road
York PA 17403
717-741-1000

Homewood Suites
200 Masonic Drive
York, PA, 17406
717-434-1800

Hampton Inn & Suites Hilton York South
2159 South Queen Street
York PA 17402
717-741-0900

Greater Shrewsbury Convention and Visitor's Bureau
www.shrewsburyguide.info

TYPICAL SEQUENCE OF HVAC INDUSTRY COURSES



HVAC Mechanical Systems
Course #210, 3.0 CEU

Course Duration	Course Fee
Monday–Friday Class ends at 11:30 a.m. on Friday	$1670 per student

Enroll Now

The fundamentals of HVAC mechanical equipment operation are taught in this survey, hands-on course. Designed for personnel responsible for the selection, design, installation, calibration or maintenance of HVAC mechanical equipment. It emphasizes hands-on activities with boilers, chillers, air handlers and other operating equipment from a variety of manufacturers. Students will gain a comprehensive understanding of operating principles and the proper use of test instruments to verify equipment performance.

Course Topics

- HVAC System Types and Piping Systems
- Psychrometrics
- Air Handlers, Types and Characteristics
- Fans and Fan Characteristics
- Dampers and Damper Actuators
- Valves and Valve Actuators
- Facility Management Systems
- Controls and Components
- Boilers and Boiler-Related Equipment
- Heat Exchangers and Pumps
- Refrigeration Fundamentals
- Reciprocating Chillers and Accessories
- Centrifugal Chillers
- General Troubleshooting
- Hands on Lab
- Final Review

Fundamental Control Strategies for HVAC Systems
Course #215, 3.0 CEU

Course Duration	Course Fee
Monday–Friday Class ends at 11:30 a.m. on Friday	$1670 per student

Enroll Now

This introductory course is designed for anyone who operates, maintains or troubleshoots HVAC control systems. Students will analyze a number of HVAC Systems and their associated controls, including central plant, air and water distribution and terminal systems. The strategies learned can be applied to any controls system type or manufacturer.

Course Topics

- HVAC Environment, Systems and Controls
- Psychrometrics, Air Properties and HVAC Processes
- Control System Fundamentals
- Sensor Types and Applications
- Controls System Configurations
- Feedforward and Feedback Control Loops
- Reset Control Strategies
- Controlled Devices: Valves, Dampers,and Actuators
- Hot/Chilled Water Distribution Systems
- Control Strategies for Water Distribution Systems
- Hot/Chilled Water Terminal Systems
- Control Strategies for Water Terminal Systems
- Air Distribution Systems
- Control Strategies for Air Distribution Systems
- 100% OA System Control Strategies
- Mixed Air System Control Strategies
- Variable Air Volume Control Strategies
- VAV Terminal Unit Control Strategies
- Introduction to Facility Management Systems
- Hands on Lab
- Final Review

HVAC Pneumatic Controls - Multi Manufacturer
Course #221, 2.0 CEU

Course Duration	Course Fee
Tuesday-Thursday Class ends at 3:30 p.m. on Thursday	$1520 per student

Enroll Now

This course provides a comprehensive overview of maintenance requirements, calibration procedures and troubleshooting techniques. Hands-on lab exercises emphasize calibrating and troubleshooting using pneumatic controls from a variety of manufacturers.

Recommended Prerequisite:

Fundamental Control Strategies for HVAC Systems (**#215**) or HVAC Mechanical Systems (**#210**) or equivalent experience

Course Topics

- Pneumatic Air Supply and Distribution Systems
- Room Control – Thermostats and Humidistats
- Relation of Controller and Controlled Device
- Single Setpoint Room Controllers, Thermostats and Humidistats
- Dual Setpoint Room Controllers
- Pneumatic Controlled Devices: Valves, Dampers, Actuators, Pilot, Positioners
- Auxiliary Devices
- Pneumatic Transmitters (Remote Sensing)
- Single Input Receiver Controllers
- Dual Input Receiver Controllers

HVAC Equipment Maintenance
Course #225, 2.0 CEU

Course Duration	Course Fee
Tuesday-Thursday Class ends at 3:30 p.m. on Thursday	$1520 per student

Enroll Now

This introductory course provides an overview of the maintenance tasks and techniques that are typically required on HVAC equipment. Individuals new to HVAC maintenance, managing a maintenance function or desiring a refresher will benefit. Students will learn how to perform proper maintenance, safety procedures and basic troubleshooting techniques. The boiler portion of this course can be used as review for a local boiler license exams.

Course Topics

- Overview of HVAC
- Electrical Systems
- OSHA Lockout/Tagout Training
- Refrigeration Maintenance and Troubleshooting
- Centrifugal Systems Overview
- Pump Maintenance
- Cooling Towers
- Air Handling Systems
- Boilers
- Air Compressor Maintenance
- Hands on Lab
- Final Review

OptiView Control Panel
Course #2100, 1.3 CEU

Course Duration	Course Fee
Tuesday-Wednesday Class ends at 3:30 p.m. on Wednesday	$1270 per student

Enroll Now

This two-day course for service personnel covers the OptiView graphic micro-processor control center. Basic navigation, panel architecture, operation and service of the OptiView Control Centers are covered in this course. Labs include hands-on training using OptiView Control Panel simulators.

Course Topics

- OptiView Basics
- OptiView Architecture: Component Identification, Location and Functionality
- OptiView Operation: Screen Navigation,Program Download, Codes, Configuration Setup, System Commissioning Checklist
- System Calibration, Service Setpoints and Reset Procedures
- Electro-Mechanical Starter Board
- Solid State Starter Board
- Variable Speed Drive Board
- High Speed Thrust Bearing Limit Switch
- Proximity Probe, Refrigerant Level Control
- Sale Order Data, Custom User ID and Password, Record Setpoint Changes
- High Condenser Pressure Warning Threshold
- Smart Freeze Protection
- Diagnostics and Troubleshooting
- Advanced Diagnostics, Trend Screen Setup
- Hands on Lab

YK High Pressure Centrifugal Operations/Maintenance
Course #2102, 2.0 CEU

Course Duration	Course Fee
Tuesday-Thursday Class ends at 3:30 p.m. on Thursday	$1520 per student

Enroll Now

Students will learn about the internal workings of the YK high-pressure centrifugal single-stage compressor, oil return system, OptiView Control Center and other components and subsystems. A comprehensive review of the preventive maintenance schedule and system capacity checkout procedure is also covered.

Course Topics

- Centrifugal Compressor Theory of Operation
- YK Chiller Design and Component Functionality
- YK Seasonal Start-up
- OptiView Basics: Application, Terminology
- OptiView Architecture: Component Identification, Component Location
- OptiView Operation: Screen Navigation, Interpretation, and Modification
- Maintenance
- Troubleshooting
- Warranty
- OptiView Simulator Hands on Lab
- Evaluating Chiller Performance

YCAV Air Cooled Rotary Screw Liquid Chillers*
Course #2103, 2.0 CEU

Course Duration	Course Fee
Tuesday-Thursday Class ends at 3:30 p.m. on Thursday	$1520 per student

Enroll Now

This three-day course teaches service personnel about the YCAV Chiller features, including the screw compressor, system ancillary components, start-up procedures, unit operation and maintenance. *Dress code: For safety, closed-toe, leather shoes and long pants are required.

Course Topics

- Screw Chiller Basics
- Basic Electronics
- VSD Basics
- VSD and Control Panel Architecture
- Operation and Sequencing
- Latitude Simulator Exercises
- Information and Safety, Handling and Storage
- VSD Troubleshooting
- Maintenance
- Unit Troubleshooting
- Hands on Lab

Absorber Operations/Maintenance
Course #2104, 2.0 CEU

Course Duration	Course Fee
Tuesday-Thursday Class ends at 3:30 p.m. on Thursday	$1520 per student

Enroll Now

This course teaches operators and technicians about the operation and controls associated with the YORK® lithium bromide absorption chillers. Absorption theory including P/T relationships and solution chemistry are also covered. The operation and operating procedures for both Isoflow (single stage) and Paraflow systems (two stage) are reviewed with an emphasis on preventive maintenance procedures.

Course Topics

- Basic Refrigeration Principles
- Units of Measure, Types of Heat
- Absorption Principles
- Solution Chemistry
- YIA Components and Cycle
- Water Circuits
- YPC Components
- YPC Purge System
- Operating Information, Setpoints and Warnings
- System and Safety Cycling Shutdowns
- Data Logging
- Operation and Maintenance
- Crystallization
- Unit Operation and Operational Limitations
- Refrigerant Contamination
- Heating/Cooling Changeover
- Preventive Maintenance
- Schedules
- Hands on Lab

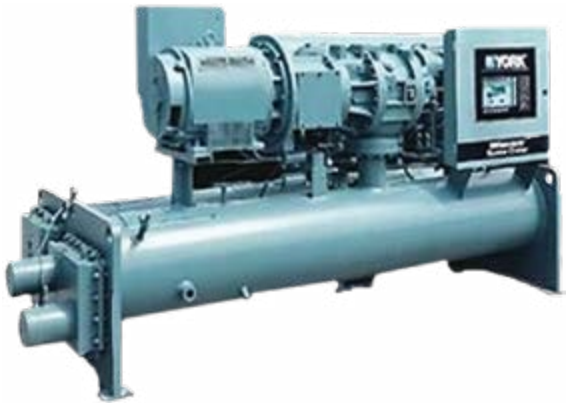
YS/YR Rotary Screw Chillers
Course #2105, 2.0 CEU

Course Duration	Course Fee
3 Days Course ends at 3:30 p.m.	$1520 per student

Enroll Now

Familiarize yourself with the operation of the YS/YR Rotary Screw Water chiller. The students will learn about all components related to system operation and maintenance, including compressor capacity control, set-up and navigation of the OptiView Control Center, and other system ancillaries. This course includes hands-on training using OptiView Control Panel simulators.

A comprehensive review of the preventive maintenance schedule and system capacity checkout further enhances the student's total understanding of unit operation, maintenance, and troubleshooting.



Course Topics

- Refrigeration Theory
- Screw Compressor Theory of Operation
- YS/YR Chiller Design and Component Functionality
- YS/YR Chiller Design and Component Functionality (continued)
- YS/YR Maintenance
- Seasonal Start-up
- Troubleshooting
- Simulator Exercises
  - Simulator Familiarization
  - Configuration Setup
  - Custom User ID and Passwords
  - Record Setpoint Changes
- Diagnostics and Troubleshooting
  - Advanced Diagnostics
  - Pressure Transducers
  - Temperature Thermistors

YCAS Air Cooled Rotary Screw Liquid Chillers*
Course #2106, 1.3 CEU

Course Duration	Course Fee
Tuesday-Wednesday Class ends at 3:30 p.m. on Wednesday	$1270 per student

Enroll Now

Students will become familiar with system components and functions, refrigerant flow, compressor capacity control and start-up procedures. They will also review the operation and maintenance procedures for the chiller and ancillary systems, including MicroPanel operation, setup and service procedures. *Dress code: For safety, closed-toe, leather shoes and long pants are required.

Course Topics

- Introduction to Screw Technology
- Compressor Construction
- Mechanical Operation
- Mechanical Troubleshooting
- Mechanical Maintenance
- Electrical Troubleshooting
- Installation Requirements
- Control Panel: Internal Layout
- System Parameters and Logic Controls
- Board In/Out Connection
- Wiring Diagrams
- Motor Protection and Communication with BAS
- Hands on Lab

YT/YK Centrifugal Chiller and Compressor Overhaul*
Course #2107, 3.3 CEU

Course Duration	Course Fee
Monday-Friday Class ends at 3:30 p.m. on Friday	$2570 per student

Enroll Now

Service personnel will become familiar with the operation and maintenance of centrifugal systems. Students will review R-11, R-123, R-22 and R-134a single stage centrifugal chillers. They will also learn the internal workings of the compressor, oil return system, lube circuit, purge and heat exchangers. The OptiView Control Center plus preventive maintenance and system checkout procedures are also addressed along with a hands-on teardown and rebuild of a YK centrifugal compressor. *Dress code: For safety, closed-toe, leather shoes and long pants are required.

Course Topics

- Refrigeration Theory
- Centrifugal Compressor Theory of Operation
- YT/YK Chiller Design and Component Functionality
- YT/YK Maintenance
- Seasonal Start-up
- Unit Troubleshooting
- Compressor Teardown/Reassembly
- OptiView Basics
- OptiView Operation
- OptiView Start-up and Troubleshooting
- High Speed Thrust Bearing Limit Switch
- Refrigerant Level Control
- Oil Pump Variable Speed Drive
- Hands on OptiView Labs

YPAL Series 100 Packaged RTU
Course #2108, 1.3 CEU

Course Duration	Course Fee
Tuesday-Thursday Class ends at 3:30 p.m. on Thursday	$1520 per student

Enroll Now

Students will learn the theory of operation of the Constant Volume and Variable Volume Eco2 Rooftop Unit. Component functions, subsystems are also discussed, along with an introduction to the FlexSys Systems. The students will become familiar with the unit's wiring and communication cards, and the programming and sequence operation.

Recommended Prerequisite:
Entry to Mid- level Technician

Course Topics

- Safety Review
- Eco2 System Overview
- Constant Volume/Variable Volume Systems
- Eco2 Physical Data
- Unit Wiring
- Introduction to FlexSys System
- BAS Communication
- IPU Architecture
- Unit Configuration and Start-up
- Programming and Sequence of Operation

YVAA Air Cooled Screw Chiller*
Course #2111, 1.3 CEU

Course Duration	Course Fee
Tuesday-Thursday Class ends at 3:30 p.m. on Thursday	$1520 per student

Enroll Now

This three-day course teaches experienced service technicians about the YVAA Chiller. The course will include features of this unit and the differences in installation, operation and maintenance from the YCAV. *Dress code: For safety, closed-toe, leather shoes and long pants are required.

Recommended Prerequisites:
- Working knowledge of the YCAV/YCIV Chiller
- Working knowledge of VSDs
- Understanding of basic electronics

Course Topics

- Chiller layout and components
- Safety, handling
- Installation
- Operation/Maintenance
- Troubleshooting
  - VSD
  - Unit
- Simulation Exercises

YVMA Water Cooled Screw Chiller*
Course #2112, 1.3 CEU

Course Duration	Course Fee
Tuesday-Wednesday Class ends at 3:30 p.m. on Wednesday	$1270 per student

Enroll Now

This two-day course teaches experienced service technicians about the YVWA Chiller. The course will include features of this unit and the differences in installation, operation and maintenance from the YCAV. *Dress code: For safety, closed-toe, leather shoes and long pants are required.

Recommended Prerequisites:
- Working knowledge of the YCAV/YCIV Chiller
- Working knowledge of VSDs
- Understanding of basic electronics

Course Topics

- Product Description
- Innovative Technology
- VSD Components and VSD Cooling Circuit
- VSD Operation and Faults
- Chiller Faults and Troubleshooting
- Chiller Maintenance

YLAA Chiller Start-up & Troubleshoot
Course #2114, 2.0 CEU

Course Duration	Course Fee
Tuesday-Thursday Class ends at 3:30 p.m. on Thursday	$1520 per student

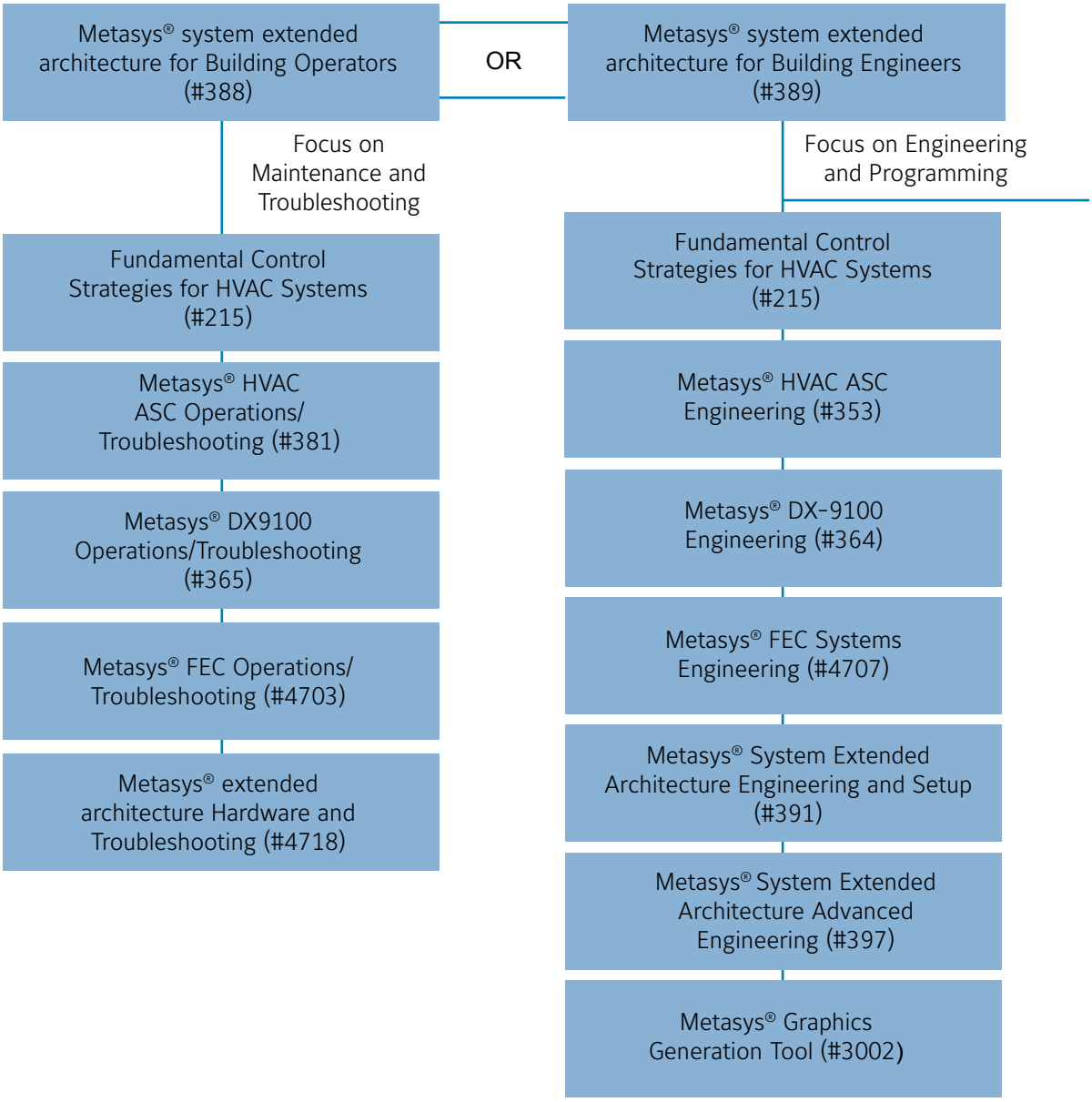
Enroll Now

Students will learn the techniques, strategies and skills required to operate, repair, start-up and maintain York® YLAA chiller and YLPA heat pump/chillers using multiple scroll compressors in each system. The techniques acquired in this course may be applied to other York® small tonnage chillers and condensing units such as YCAL, YLUA and YCUL models.

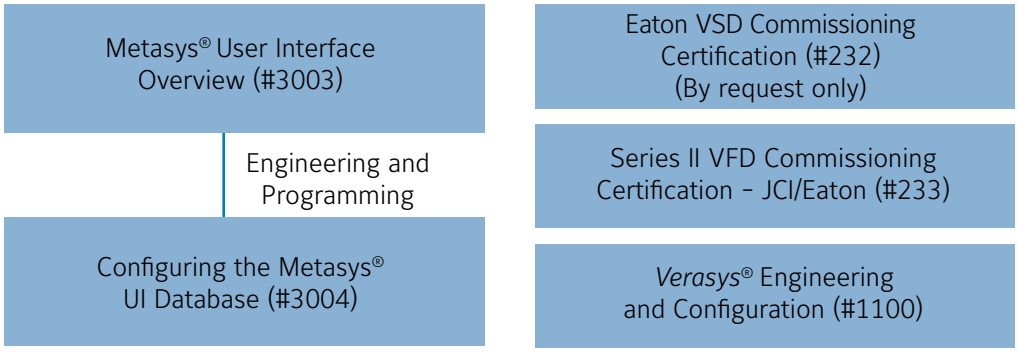
Course Topics

- Safety
- Literature
- Theory
- Components
- Operations
- Wiring Diagrams
- Installation
- Startup
- Maintenance
- Evaluating Performance
- Warranty

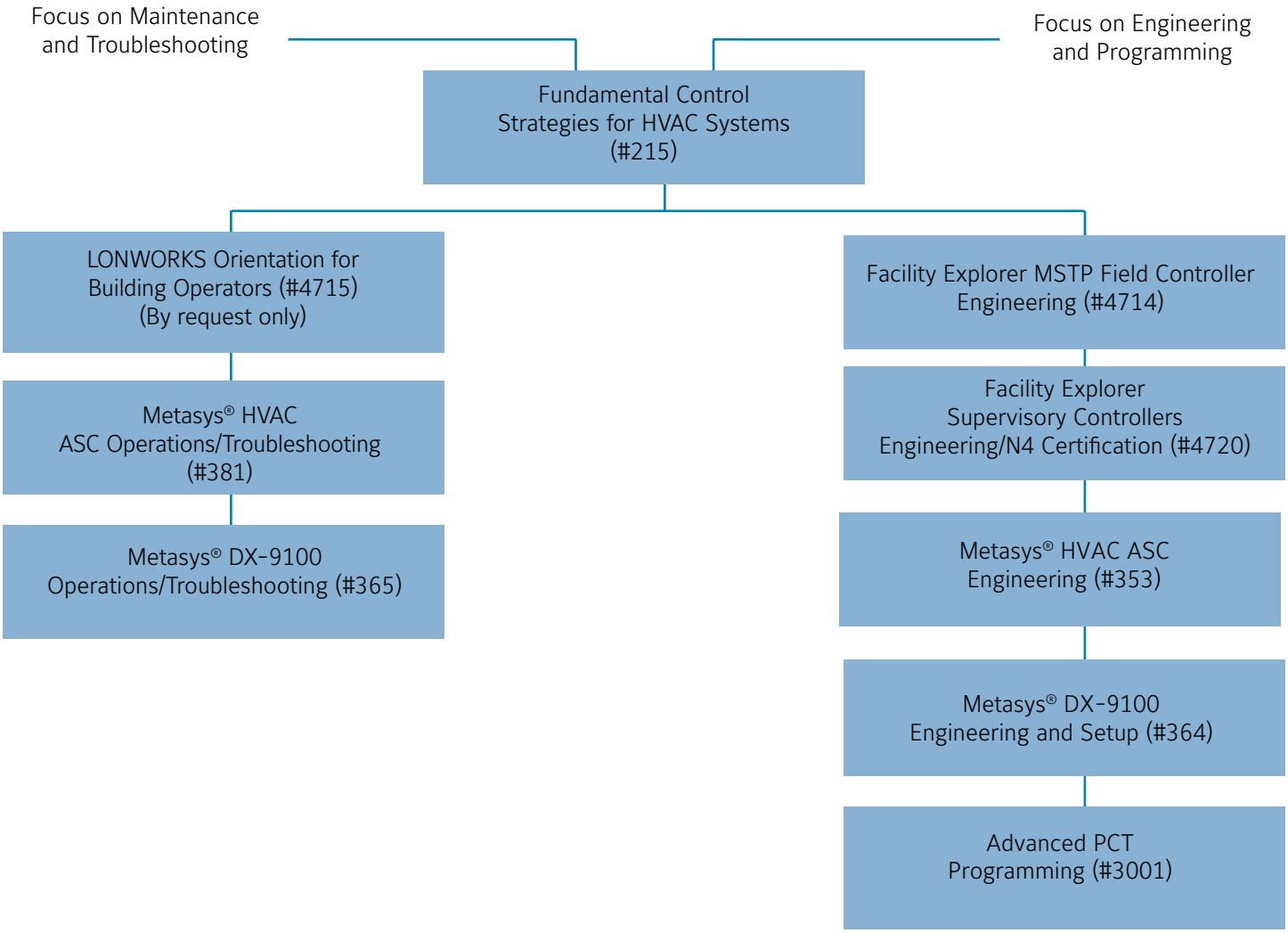
TYPICAL SEQUENCE OF COURSES FOR METASYS® SYSTEMS



Note: Your facility may utilize ASC controllers, DX, FEC controllers, or a combination of any of these products. Make certain to select the appropriate courses based on your facility.



TYPICAL SEQUENCE OF COURSES FOR FACILITY EXPLORER®



Note: Your facility may include a variety of Metasys® and Facility Explorer equipment, making it appropriate for you to choose courses from this flowchart and from others in this section.

TYPICAL SEQUENCE OF COURSES FOR METASYS® PMI/NCM NETWORKS

Metasys® PMI Operation: The Basics (#300A) (By request only)

Focus on Maintenance and Troubleshooting

- Fundamental Control Strategies for HVAC Systems (#215)
- Metasys® HVAC ASC Operations/Troubleshooting (#381)
- Metasys® DX9100 Operations/Troubleshooting (#365)

Focus on Engineering and Programming

- Fundamental Control Strategies for HVAC Systems (#215)
- Metasys® HVAC ASC Engineering (#353)
- Metasys® DX-9100 Engineering (#364)

TYPICAL SEQUENCE OF COURSES FOR METASYS® VALIDATED ENVIRONMENTS

Engineers

- Fundamental Control Strategies for HVAC Systems (#215)
- Metasys® FEC Systems Engineering (#4707)
- Metasys® HVAC ASC Engineering (#353)
- Metasys® DX-9100 Engineering (#364)
- Metasys® System Extended Architecture Advanced Engineering (#397)
- Metasys® FEC Custom Programming (#4704)

Designers

- Metasys® System Extended Architecture Engineering and Setup (#391)
- Metasys® Graphics Generation Tool (#3002)

Note: Your facility may include a variety of Metasys® and Facility Explorer equipment, making it appropriate for you to choose courses from this flowchart and from others in this section.

Series II VFD Commissioning Certification Training - JCI/Eaton
Course #233, 0.7 CEU

Course Duration	Course Fee
1 Day 8:00 a.m. - 5:00 p.m.	$500 per student

Enroll Now

This 1 day class is taught by an Eaton representative and provides factory authorized certification of personnel responsible for commissioning the Johnson Controls VSD series II product line. The first half of the instruction provides a high level of technical detail related to the setup and operation of the VSD series drive. The second half provides technical detail on how to diagnose and repair VFD's in general. Certified startups provide a 3rd year VFD warranty extension at no additional charge. Students will receive a training certificate upon course completion and you must be present for all days of class and pass a knowledge test to receive your training certificate.

Prerequisites:
Each student will be required to provide their own laptop, Internet patch cable ** and a digital multi-meter.

Course Topics

- Product Overview
- Picking VFD out of catalogue
- Description of Series II VFD Power Section, Control Module, and Keypad
- Resources Online, CD, etc.
- Applications Overview
- Initial Commissioning steps
- Install Eaton Max Connect and review software features
- Software Applications and Programming Exercises
- Finish Applications and Programming Exercises
- Final Commissioning Steps
- Commissioning Reports
- Warranty Program
- Troubleshooting using Flow charts
- Basic VFD troubleshooting procedures

Metasys® HVAC ASC Engineering
Course #353, 3.0 CEU

Course Duration	Course Fee
Monday-Thursday Class ends at 4:00 p.m. on Thursday	$1670 per student

Enroll Now

This course covers programming and testing control strategies for Application Specific Controllers (ASCs). The course is designed for experienced building personnel who want to expand their knowledge of HVAC Control Systems and Johnson Controls ASC devices.

Recommended Prerequisites:
Fundamental Control Strategies for HVAC Systems (**#215**) or equivalent experience.

Course Topics

- ASC Controllers
- Control Theory Terminology and Strategies
- ASC Configuration Files
- File Names and Locations
- HVACPRO Overview
- Downloading and Commissioning ASC Controllers
- Loop Tuning
- Adding Points to an ASC
- Writing a Configuration File
- UNT Controller
- AHU Controller
- VAV Controller
- VMA Controller
- Sideloops
- Optional Labs
- Misc. Controllers, Products, Topics
- Hands on Lab
- Final Review

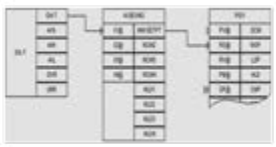
Metasys® DX-9100 Engineering Course #364, 3.0 CEU

Course Duration	Course Fee
Monday-Friday Class ends at 11:30 a.m. on Friday	$1930 per student

Enroll Now

Experienced DX-9100 users will learn how to create and modify the DX-9100 application programs using Windows-based GX-9100 software. This course is a follow-up to the Metasys® DX-9100 Operations/Troubleshooting course for students who want to develop their skills in programming and troubleshooting their DX-9100 system.

Recommended Prerequisites:
Fundamental Control Strategies for HVAC Systems (**#215**) and any Metasys® DX-9100 Operations/Troubleshooting (**#365**) and or field experience of DX front panel.



Course Topics

- Introduction to the DX-9100 System
- Front Panel Operation
- DX Commissioning Tool
- Creating an Application Using GX-9100 Software
- Input Point Configuration
- Output Point Configuration
- Expansion Point Configuration
- Control Modules
- Numeric Modules
- Programmable Logic Controller
- Using Library Functions
- Student Topic Selected Lab
- Hands on Lab
- Final Review

Metasys® DX-9100 Operations/Troubleshooting Course #365, 2.0 CEU

Course Duration	Course Fee
Tuesday-Thursday Class ends at 3:30 p.m. on Thursday	$1520 per student

Enroll Now

This introductory course teaches participants how to communicate and troubleshoot effectively using the DX-9100. This course is highly recommended for anyone involved in the day-to-day operation of a DX-9100 system.

Course Topics

- Overview of the DX-9100 Controller
- Extension and Expansion Modules
- Front Panel Operation – Viewing Inputs/Outputs
- Time, Constants, PM Data, Schedules
- Front Panel Operation – Changing PM Data
- Constants, Auto/Manual Mode
- Introduction to the GX-9100 Program
- Commissioning Mode, Calibration
- Basic System Troubleshooting Using the DX-9100
- Loop Diagnosis Using Data Graphing
- Hands on Lab
- Final Review

Metasys® HVAC ASC Operations/Troubleshooting Course #381, 3.0 CEU

Course Duration	Course Fee
Monday-Friday Class ends at 11:30 a.m. on Friday	**$1820 per student**

Students will learn about the Application Specific Controllers (ASC) used at their facility. Extensive hands-on lab activities use HVACPRO software to work with AHU, UNT, VAV and VMA controllers for troubleshooting programs and field devices.

Recommended Prerequisite:
Fundamental Control Strategies for HVAC Systems (**#215**) or equivalent experience.

Enroll Now

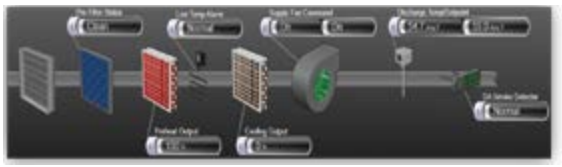
Course Topics

- Overview of ASC Controllers
- Control Theory
- Control Strategies
- File Names and Locations
- HVACPRO Overview
- Downloading and Commissioning ASC Controllers
- UNT Controller
- AHU Controller
- VAV Controller
- VMA Controller
- Sideloops
- Loop Tuning
- Hand-held interfaces: Zone Terminal and VMA
- Balancing Tool
- Hands on Lab
- Final Review

Metasys® System Extended Architecture for Building Operators Course #388, 2.0 CEU

Course Duration	Course Fee
Monday-Wednesday Class ends at 3:30 p.m. on Wednesday	**$1520 per student**

This three-day course teaches building personnel how to make the most effective and efficient use of the features of a Metasys® system extended architecture building management system. This course is for building personnel who have new installations of Metasys® system extended architecture using NAEs or NIEs or for those who have migrated from their existing Metasys® system.



Enroll Now

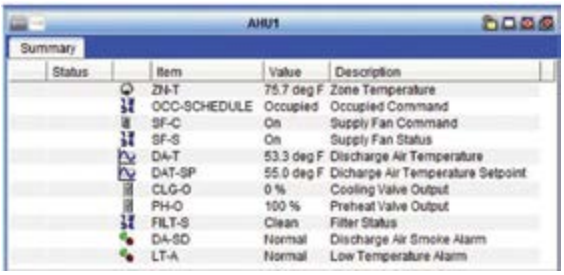
Course Topics

- Metasys® System Extended Architecture Overview
- Help File System
- Basic Navigation of the System with the User Interface
- Commanding Objects
- Scheduling
- Setting Up Alarms
- Responding to Alarms
- Trending
- Totalization
- Graphics
- Hands on Lab
- Final Review

Metasys® System Extended Architecture for Building Engineers Course #389, 3.0 CEU

Course Duration	Course Fee
Monday-Friday Class ends at 11:30 a.m. on Friday	**$1820 per student**

This course teaches building personnel how to make the most effective and efficient use of the features of a Metasys® system extended architecture building management system. This course contains additional topics not covered in the Metasys® system extended architecture for Building Operators course.



Enroll Now

Course Topics

- Metasys® System Extended Architecture Overview
- Help File System
- Basic Navigation of the System with the User Interface
- Commanding Objects
- Scheduling
- Setting Up Alarms
- Responding to Alarms
- Trending
- Totalization
- Graphics
- Setting Up Passwords
- User Views
- Audit Trails
- Sending Reports to Printers, Pagers, Emails, etc.
- Adding Inputs and Outputs to a Controller
- Reviewing Control Strategies
- Backing Up the Data
- Hands on Lab
- Final Review

Metasys® System Extended Architecture Engineering and Setup Course #391, 3.0 CEU

Course Duration	Course Fee
Monday-Friday Class ends at 11:30 a.m. on Friday	**$1930 per student**

Students will learn how to set up and manage the Network Automation Engine (NAE) database and to use the power of the System Configuration Tool to generate an NAE database from existing ASC controller programming.

Recommended Prerequisites:
Due to the material covered in the class, anyone wanting to enroll in this class is required to have had attended courses (**#389**) and (**#4707**) or (**#353**).

For End Users and/or Authorized Building Controls Specialists/ Contractors Only.

Enroll Now

Course Topics

- Course Introduction
- System Overview and Comparisons
- NAE User Interface Overview
- System Configuration Tool Overview
- Adding BACnet® Devices
- Newest Feature Objects
- Overview: Designing a New Archive Database
- Installing Patches
- NIE and Migration Options Overview
- Hands on Lab
- Final Review

Metasys® System Extended Architecture Advanced Engineering Course #397, 2.0 CEU

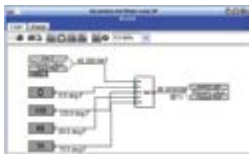
Course Duration	Course Fee
Tuesday-Thursday Class ends at 3:30 p.m. on Thursday	$1520 per student

Enroll Now

Experienced personnel will learn how to write advanced programs for facility-wide or specific mechanical control applications using the System Configuration Tool (SCT). Students will build, modify and troubleshoot routines they create.

Recommended Prerequisites:
Student must have background in operating and/or engineering the Metasys® system extended architecture. Metasys® system extended architecture Engineering and Setup (**#391**) or Metasys® system extended architecture for Building Engineers (**#389**).

For End Users and/or Authorized Building Controls Specialists/ Contractors Only.



Course Topics

- Review Metasys® system extended architecture
- Control Objects (Interlocks, Multiple Commands, LCT, etc.)
- Reset Strategies
- Sequencing Equipment
- Rotation of Equipment
- Operating Equipment per Load Needs
- Lead Lag Strategies
- Creating Calculations Including Tonnage, Highest Daily, Temperature, etc.
- Student Directed Topics and Activities
- Hands on Lab
- Final Review

Metasys® FEC Operations/Troubleshooting Course #4703, 2.0 CEU

Course Duration	Course Fee
Tuesday-Thursday Class ends at 3:30 p.m. on Thursday	$1520 per student

Enroll Now

Designed as a beginners course for people working with Field Equipment Controllers (FECs), this course shows students how to connect to FECs and how to download and test existing control programs. It also covers calibration of input sensors and setup and verification of inputs and outputs. This course is designed for building personnel who want to better understand field controller operation, commissioning and troubleshooting.

Recommended Prerequisite:
Fundamental Control Strategies for HVAC Systems (**#215**) or equivalent experience

Course Topics

- FEC Controller Overview
- Bluetooth® Wireless Setup
- Downloading and Uploading FEC Controllers
- Input and Output Setup and Checkout
- MS/TP Trunk wiring, addressing and checkout
- Overview of CCT Software Tool
- Trunk Utilities
- Hands on Lab
- Final Review

Metasys® FEC Custom Programming
Course #4704, 2.0 CEU

Course Duration	Course Fee
Tuesday-Thursday Class ends at 3:30 p.m. on Thursday	**$1520 per student**

Enroll Now

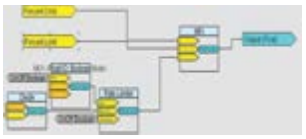
Students will learn how to create and test customized control strategies for FEC controllers in this three-day course. The course is designed for experienced building personnel who want to expand their knowledge of HVAC Control Systems and Johnson Controls FEC devices.

Recommended Prerequisites:
Metasys® FEC Systems Engineering (**#4707**) and experience using the FEC software prior to attending 4704

For End Users and/or Authorized Building Controls Specialists/ Contractors Only.

Course Topics

- Central Plant Application in CCT
- Modules and Blocks in CCT
- Activities as Containers
- Hybrid Activities
- PID and PID Pre-Processor
- State Tables
- Sequencer and Multi-stage Controller
- PRAC+ and PMAC
- Review of Custom Lab
- Hands on Lab
- Final Review



Metasys® FEC Systems Engineering
Course #4707, 2.0 CEU

Course Duration	Course Fee
Tuesday-Thursday Class ends at 3:30 p.m. on Thursday	**$1520 per student**

Enroll Now

In this advanced Field Equipment Controller (FECs) programming class, students will learn how to write and test programs for the (FECs). They will use the software simulation tool to verify that the programs satisfy the sequence of operations. The course is designed for experienced personnel who want to become proficient in writing or revising programs for Johnson Controls FEC devices. Although not a prerequisite, it is highly recommended that students are familiar of the topics found in course **#4703**.

Recommended Prerequisite:
Fundamental Control Strategies for HVAC Systems (**#215**) or equivalent experience

For End Users and/or Authorized Building Controls Specialists/ Contractors Only.

Course Topics

- Review of CCT Software as a programming tool
- Reading Control Strategies
- Creating New Applications
- State Control Concepts
- Data Flow and Program Analysis
- Simulation mode in CCT
- Writing Sideloop Programs
- Hands on Lab
- Final Review

Facility Explorer MSTP Field Controller Engineering Course #4714, 3.0 CEU

Course Duration	Course Fee
Monday-Friday Class ends at 11:30 a.m. on Friday	**$1870 per student**

Enroll Now

Participants will receive an overview of the Facility Explorer MSTP field controller system, create programs from standard tree systems using the Programmable Controller and Commissioning tool, then connect to Bluetooth® and Zigbee® connections and download code into the controllers after setting up the hardware and software to communicate properly.

For End Users and/or Authorized Building Controls Specialists/ Contractors Only.

Course Topics

- Introduction To The Facility Explorer MSTP Field Controllers System
- Creating Applications Using The Standards Tree
- Establish Peer To Peer Communications
- Using Bluetooth® To Connect To Controllers
- Downloading And Uploading Controllers
- Commissioning Inputs And Outputs
- Commissioning State Based Strategies
- Implementing Zigbee® Wireless Communications
- Making Custom Changes To Controllers
- Programming Blocks
- Analyzing PID Loops And Hybrid Activities
- Configuring Sequencers And Multistage Controllers
- Troubleshooting Network Systems

Metasys® System Extended Architecture Hardware and Troubleshooting Course #4718, 3.0 CEU

Course Duration	Course Fee
Monday-Friday Class ends at 11:30 a.m. on Friday	**$1880 per student**

Enroll Now

This hands-on course provides experienced Metasys® users with valuable diagnostic and troubleshooting skills on system hardware. Discussions and exercises cover the full range of Metasys® Network products, with an emphasis on communication solutions and other commonly experienced problems.

Required Prerequisites:
Due to the material covered in the class, anyone wanting to enroll in this class is required to have had attended courses **#389** and **#4707** or **#353**.

For End Users and/or Authorized Building Controls Specialists/ Contractors Only.

Course Topics

- Metasys® extended architecture Review
- Network Architecture
  - Ethernet Level Connections (BACnet® over IP)
  - Controller Trunk Level Connections (BACnet®/MSTP, N2, and LON)
  - SA Bus Review
- Network Automation Engines, Network Integration
- Engines and Network Controller Engines Including:
  - NAE common hardware platform
  - NAE Diagnostics, how to run them and evaluate them.
- Introduction to the SCT Tool
- Short Review FEC Controller Family; FECs, VMAs and IOM Modules, and TEC Controllers
- Calibrating Sensors and Actuators and Applying Metering Devices
- Downloading Controllers
- Metasys® System Extended Architecture Database overview and organization best practices
- ADS/ADX Servers – their role and features in Metasys® and best practices for backup of data files

Facility Explorer (FX) Supervisory Controllers Engineering/N4 Certification Course #4720, 3.4 CEU

Course Duration	Course Fee
Monday-Friday Testing will end at 5:00 p.m. on Friday	**$3000 per student**

Enroll Now

Basic instruction on design, engineer and program projects using FXWorkbench Pro running on Niagara 4. Testing for Niagara 4 Technical Certification Program (TCP) taken at end of the course.

Recommended Prerequisites:
Students must have a strong knowledge of Johnson Controls field controllers. A familiarization of building automation systems (**BAS**) would also be beneficial.

For End Users and/or Authorized Building Control Specialists/ Contractors only.

Note: Early payment discount does NOT apply

Course Topics

- Course Introduction and System Overview
- Supervisory Controller User Interface Overview
- FXWorkbench Pro Overview
- Creating a Station
- Adding N2 and BACNet® MSTP Controllers and Points
- Extension Manager and Extensions
- Control Logic
- Tagging Objects
- Scheduling
- Defining Users and Roles
- Customizing Access Permissions
- Setting up Email Notification of Alarms
- Graphics
- Controller Summary
- Hierarchy Services
- Commissioning and Backing up a Station
- Auto discovering BACNet® points
- Using Standard Graphics for Other Devices
- Enterprise Connectivity
- Technical Certification Program (TCP) Examination

Verasys® Technical Training Course #1100, 1.2 CEU

Course Duration	Course Fee
Wednesday-Thursday Class ends at 3:00 p.m. on Thursday	**$500 per student**

Enroll Now

Receive a comprehensive introduction to *Verasys*® control system. This course will introduce you to the capabilities of this new plug and play product. You will learn how easily configurable this system is without using any tools or software. You will be taught how to wire, address and configure controllers that make up the *Verasys*® Control system. You will have several hands on labs configuring and change attributes within the *Verasys*® system and controllers.

Recommended Prerequisites:
3 E-Learnings on COPB, VAV and CV air systems

Students are required to bring personal/work laptop computer with WiFi or a Tablet

Course Topics

- Intro to the *Verasys*® Control System
- Review Constant Volume application
- Review Change over Bypass application
- Review VAV and VAV box applications
- Intro to *Verasys*® Controllers
- Smart Building Hub Intro
- Navigating through the *Verasys*® system
- Setup of system parameters for each controller
- Hands on Lab

TYPICAL SEQUENCE OF COURSES FOR SECURITY SOLUTIONS

Technical Training

Security Field Controllers Configuration and Maintenance (#4203)

P2000 Security Management System Configuration (#4002)

Operator Training

P2000 Operations with Video Imaging (#4223)

P2000 Configuration, Operation and Maintenance
Course #4002, 2.7 CEU

Course Duration	Course Fee
Monday-Thursday Class ends at 3:30 p.m. on Thursday	**$1670 per student**

Enroll Now

Students will learn the process to install, update and configure a P2000 system. They will also learn how to operate the software including alarm handling, badging and more.

Recommended Prerequisites:
Security Field Controllers Configuration and Maintenance (**#4203**) and Building Automation System (**BAS**) Networking (CBT7500)

Course Topics

- Introduction and Software Installation
- Panel Communications and Configuring the System
- Time Zones and Holidays
- Panel Connections and Configuration
- Terminals, Outputs and Inputs
- Elevator Configuration, Terminal and Access Groups
- Custom Badge Designs
- Operating the System
- Report Generation
- Security Threat Level, Area Control, Events
- System Maintenance
- Hands on Lab
- Final Review

P2000 Operations and Administration
Course #4223, 1.3 CEU

Course Duration	Course Fee
Monday-Tuesday Class ends at 3:30 p.m. on Tuesday	**$1270 per student**

Enroll Now

This course provides both new and veteran P2000 operators and administrators with the skills necessary to successfully administer and operate a P2000 Access Control System with video imaging.

Course Topics

- System Overview
- System Shutdown/Startup
- Logging into the System
- Basic System Configuration
- Real Time List
- System and Operator Permissions
- Event Action and Trigger Configuration
- System Backup
- Responding/acknowledging Alarms and Maps
- Door Output Control
- Cardholder Creation and Deletion
- Image Recall
- Running Reports
- Hands on Lab
- Final Review

INSTRUCTOR-LED DISTANCE LEARNING COURSES

Johnson Controls

Advanced PCT Programming Course #3001

Course Duration	Course Fee
3 Days	$950 per student

Enroll Now

Students will learn how to create and test customized control strategies for General Purpose Programmable Controllers (PCG) controllers in this three-day online course. The course is designed for experienced building personnel who want to expand their knowledge of HVAC Control Systems and Johnson Controls PCG devices.

Recommended Prerequisites:
Facility Explorer MSTP Field Controller Engineering (**#4714**) and PCG/PCV/PCX controller programming experience. Students will need phone and a computer with high speed internet access to participate in the course.

For End Users and/or Authorized Building Controls Specialists/ Contractors Only.

Course Topics

- Central Plant Application in Programmable Controller Tool (PCT)
- Modules and Blocks in PCT
- Activities as Containers
- Hybrid Activities
- Proportional plus Integral plus Derivative (PID) and PID Pre-Processor
- State Tables
- Global Sequencer and Multi-stage Controller
- Pattern Recognition Adaptive Control (PRAC+) and Pulse Modulation Adaptive Control (PMAC)
- Review of Custom Lab
- Hands on Lab
- Final Review

Metasys® Graphics Generation Tool Course #3002

Course Duration	Course Fee
3 Days	$950 per student

Enroll Now

This course teaches students how to create and modify the custom graphics used to both monitor and actively change building parameters and settings in a Metasys® automation system. It is a three-day online internet course which combines active instructor facilitation with student practice sessions with the facilitator available for questions. This course is for individuals interested in creating and editing Graphics+Metasys® graphic files using Graphics Generation Tool (GGT) software.

Recommended Prerequisites:
Metasys® system extended architecture for Building Engineers (**#389**) OR Metasys® system extended architecture Engineering and Setup (**#391**). Students will need phone and high speed internet access to participate in the course.

For End Users and/or Authorized Building Controls Specialists/ Contractors Only.

Course Topics

- Provide an overview of the Graphics + tool with its features and terminology.
- Introduce the "Style Guide."
- Familiarize the student with how to commission graphics.
- Familiarize the student with how to create new graphics using the Graphic Generation Tool.
- Provide an opportunity for hands-on practice implementing key Graphics+tasks.

Metasys® User Interface Overview Course #3003

Course Duration	Course Fee
6 Hours	$395 per student

Enroll Now

Metasys® User Interface (UI) Overview is a distance learning course designed to introduce the new functions and features of the Metasys® UI. Through an explorative interactive study, participants will gain an insightful, useful understanding of the UI layout, navigation, and help resources. This course is geared towards users interested in learning the new UI.

Course Topics

- Logging in and out of the Metasys® UI
- Use Help and the Take a Tour features for continuous learning
- Navigate the Metasys® UI using Spaces and Equipment
- Use Spaces to identify operational statuses
- Use Equipment to identify status of points
- Commanding and viewing Trends
- Identify and respond to Alarms
- Utilize the Widgets to obtain details of space and equipment points

Configuring the Metasys® UI Database Course #3004

Course Duration	Course Fee
6 Hours	$395 per student

Enroll Now

This one-day Internet based distance learning course teaches building personnel procedures and techniques on how to build and configure the Metasys® UI user interface using the System Configuration Tool (SCT) software. This course is for building personnel who have the responsibility for creating and maintaining the database that is used in Metasys® servers and supervisory controllers.

Connection information and course documents will be emailed to the enrolled students one week prior to the course date, by the Instructor of that course. This email will contain the internet connection information (Web Excollaboration software will be used) and Phone Conference connection information. Also included in this email, will be the SCT Archive image files and installation instructions into the Student's SCT computer prior to the course. (Contact your local JCI representative if you are not confident in importing Archive databases into SCT.)

Computer Prerequisites:

- The latest version of SCT installed on the student's computer. (A minimum version of 11.0 for SCT is required.)
- Internet access*
- Phone line access for a phone conference connection

Prerequisites include:

- Basic usage skills of SCT, as taught in Courses 389 or 391, are required. (These two courses are not a perquisite for taking course C-3004, but the SCT skills such as Uploading/ Downloading and understanding the SCT's All Items tab contents are required.)
- Basic usage skills of Metasys® UI, as taught by going through all the scenarios found in the "Take a Tour" feature of the Metasys® UI. (Access to the Take a Tour is found by selecting your user name when logged into the Metasys® UI. Then select the Take a Tour option.)

Course Topics

- Overview SCT operation
- Overview Metasys® UI operation
- SCT Help File System
- Creating Spaces in SCT
- Creating Equipment in SCT

Security Field Controllers Configuration and Maintenance Course #4203

E-learning Course

Enroll Now

This course covers operational theory, configuration and maintenance of the S321-IP and CK721-A Controllers and S-300 Series Field Controllers and associated devices and terminals. Controllers include:

S300 Modules
S300-DIN-RDR2SA
S300-DIN-I8O4
S300-DIN-RDR8S
S300-DIN-I32O16
S321-IP
CK721-A

Course Topics

- Panel Communications and terminal addressing
- Panel Connections and Configuration
- Terminals, Outputs and Inputs
- CK721-A and S321-IP controller IP addressing
- S300 Communications Bus wiring
- Security Threat Level, Area Control, Events
- System Maintenance
- Hands on Lab
- Final Review

COURSES OFFERED BY REQUEST ONLY

Johnson Controls

COURSES OFFERED BY REQUEST ONLY

The following courses are only available at your request. They can usually be conducted at your site or at one of our Training Institute locations with a minimum of eight students.

These courses are not included in the Learning Catalog schedule at the back of this publication. For more information about the content, availability and pricing of these courses, call the Training Institute Registrar at 800-524-8540 or 414-524-4286 or email at **cg-customer.registrar@jci.com**.

Eaton VSD Commissioning Certification Training

Course #232, 1.3 CEU

This course provides factory authorized certification of personnel responsible for commissioning the Johnson Controls VSD series product line. The first half of the instruction provides a high level of technical detail related to the setup and operation of the VSD series drive. The second half provides technical detail on how to diagnose and repair VFDs in general. Certified startup provides a 3rd year VFD warranty extension at no additional charge. Students will receive a training certificate upon course completion.

Metasys® LN ASC Operations

Course #4600, 2.0 CEU

Take control of your facility equipment by programming your own control strategies for Metasys® LN ASC Controllers. Participants will learn LON network terminology and setup, how to load the MCL tool software, as well as commission LN ASC Controllers.

COURSES OFFERED BY REQUEST ONLY

Airside System Analysis

Course #4706, 2.0 CEU

Students will learn how to analyze the current operation of their heating, cooling, humidification and dehumidification air distribution system. They will also learn how to locate airside system problems, find solutions as well as fine-tune their building HVAC system for the highest degree of comfort while simultaneously decreasing operating cost. Many practical air system related topics are covered including determining the current operating capacity of a system, adjusting the system for optimum comfort and lowest operating cost, resizing blower motors for energy savings and much more.

LonWorks Orientation for Build Operators

Course #4715, 0.7 CEU

This one-day course teaches building personnel the basics of LonWorks control system. This course is for building personnel who need to have Basic LonWorks knowledge, no matter what system they are using.

METASYS® LEARNING TRACK CONCENTRATIONS

In a world of ever-increasing technology, it is essential that everyone maintain a high level of knowledge relating to his or her line of work. At the Johnson Controls Training Institute, we understand this and are working to keep you at the forefront of the industry. We are excited to offer three programs designed to make you a more valuable asset to your team.

The benefits to business include:
- Better Qualified Employees
- Rapid Problem Resolution
- A Self-reliant Workforce
- Less Expensive Training per Class

Different people have different needs so we offer concentrations in Metasys® Operation, Metasys® Troubleshooting and Maintenance, and Facility Engineering.

The benefits to the technicians include:
- Increased Job Skills
- Preplanned Personal Growth

Upon successful completion of at least four courses within a Learning Track Concentration in a five-year period, you will be awarded a plaque which denotes the level of your achievement.

METASYS® LEARNING TRACK CONCENTRATIONS

Metasys® Operations Concentration

- HVAC Mechanical Systems (#210)
- Fundamental Controls Strategies for HVAC Systems (#215)
- Any Metasys® Facility Operator Course: 388, 389
- Metasys® HVAC ASC Operations/Troubleshooting (#381)
- Metasys® DX-9100 Operations/Troubleshooting (#365)
- Metasys® FEC Operations/ Troubleshooting (#4703)

Metasys® Troubleshooting and Maintenance Concentration

- Any Metasys® Facility Operator Course: 388, 389
- Metasys® HVAC ASC Operations/Troubleshooting (#381)
- Metasys® DX-9100 Operations/Troubleshooting (#365)
- Metasys® FEC Operations/ Troubleshooting (#4703)
- Metasys® Extended Architecture Hardware and Troubleshooting (#4718)

MSEA Facility Engineering Concentration

- Any Metasys® Extended Architecture Course: 388, 389
- Metasys® HVAC ASC Engineering (#353)
- Metasys® DX-9100 Engineering (#364)
- Metasys® System Extended Architecture Engineering and Setup (#391)
- Metasys® Graphics Generation Tool (#3002)
- Metasys® FEC Systems Engineering (#4707)
- Metasys® FEC Custom Programming (#4704)
- Metasys® Extended Architecture Hardware and Troubleshooting (#4718)

LEARNING PACKAGES

Learn what you need, when you need it with Johnson Controls Training Institute Learning Packages. Learning packages are a way to prepare for an instructor-led course or to review material you may not use everyday. While some packages are generic in content, all are oriented toward Johnson Controls equipment to provide additional assistance and information in using our products.

Computer-Based Training

Use the power of a computer to enhance your knowledge of building environments or variable air volume systems, or to build your skill in using the Metasys® Operator Workstation. Interactive computer-based training programs provide an engaging learning experience, the opportunity to demonstrate your knowledge and skills and immediate feedback of your performance.

Written Material

Sometimes we need to "see it on paper" in order to believe it...the Johnson Controls Training Institute offers a wide range of written materials for learners. Many of our workbooks contain hands-on lab activities for you to complete using your own equipment, in your own facility.

To Order Call

Quantity, site and educational discounts are available for most packages. Call 800-524-8540 for details.

Application, Installation and Operation of Controls for Commercial Comfort Systems (C-3100-EN)

This three-part, computer-based course builds knowledge and skill in both the application and installation of controls for Commercial Comfort Systems. (©2008 Johnson Controls, Inc.)

Price: $99.00

Topic Outline:

- Commercial Comfort System Control Components
- HVAC Systems Types
- Zoning Design Considerations
- Planning a System Installation
- Layout of Control and Network Devices
- Mounting Devices
- Wiring Considerations
- Terminating
- Addressing Controllers
- Balancing – Operations

HVAC Controls Manual (P2074)

This handy reference provides a clear, concise explanation of the application of pneumatic controls to HVAC systems. (©1987 Johnson Controls, Inc.)

Price: $30.00

Topic Outline:

- Basic Control Concepts, Fan Systems
- Pneumatic Power Supplies, Pneumatic Relays
- Room Thermostats and Humidistats
- Valves and Actuators
- Dampers, Actuators and Positioners
- Auxiliary Devices, Dual Setpoint Thermostats
- Pneumatic Transmission, Master/Submaster

Building Environments: HVAC Systems (P99)

This comprehensive, easy-to-read text builds your understanding 1of HVAC systems and the controls that manage them. (©1997 Johnson Controls, Inc.)

Price: $75.00

Topic Outline:

- HVAC Systems and Facility Management
- Heat, Temperature and Pressure Basics
- Managing Human Comfort
- Determining Loads on an HVAC System
- Psychrometrics, HVAC System Types
- Heat Exchange and Recovery Equipment
- Refrigeration Cycle and Equipment
- Centrifugal Pumps and Hydronic Systems
- Air Cleaning Equipment, Fans, Ducts, Humidifiers
- Control Strategies for Occupant Comfort
- Advanced Technology for Effective Facility Control

Building Automation System (BAS) Networking (CBT7500)

Build your knowledge, comprehension and vocabulary about basic networking concepts and terminology. (©2003 Johnson Controls, Inc.)

Price: $195.00

Topic Outline:

- Network architecture, Devices, Addressing
- Metasys® Products Functioning on Networks
- Cabling
- Hubs, Repeaters, Switches, Bridges, Routers
- Remote Access Options

HVAC System Types (P55)

Color animated graphics and views of actual HVAC system components provide an in-depth study of the ASHRAE classifications. (©1991 Johnson Controls, Inc.)

Price: $195.00, Additional Workbooks: $24 each, $200 for ten

Topic Outline:

- All Water Systems – One Pipe Systems, Two Pipe Systems, Four Pipe Systems, Unit Ventilator
- All Air Systems – Single Path, Dual Path, Variable Air Volume, Air and Water Systems, Room Control, Return Air Control, Discharge Control
- Air Water Systems

LEARNING PACKAGES ORDER FORM

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City/State/Zip	
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Payment must be received prior to shipment.

◯ Visa® or ◯ MasterCard® or ◯ American Express®

Exp. Date

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(Signature)

(Email address to send receipt)

◯ Check for $ (in U.S. Currency), payable to Johnson Controls Training Institute.

Please attach check to the form.

Provide complete shipping address to avoid delays in processing your order. Orders are processed within 72 hours.

◯ UPS Ground (Allow 7-10 days delivery time)

◯ Airborne Next Day Air (Orders placed after 2:00 CST will be processed the next working day.)

◯ Special Handling -- Ship via

LM/Pkg/CBT Number	Title / Description	Quantity	Total Price

Shipping and Handling

(Shipping charges will be added)

(In accordance with your state sales tax laws)
Tax Due

(U.S. Dollars)
Total

Fax:
877-403-6625

Or mail form and payments to:
Johnson Controls Training Institute/M45
507 East Michigan Street
Milwaukee, WI 53202

Questions about your order? Call Learning Services at 800-524-8540.
(Please print additional copies of this form, if necessary, for further reference or use.)

FACILITY O&M WORKFORCE ASSESSMENTS AND DEVELOPMENT SOLUTIONS

With Facility Operation & Maintenance (O&M) budgets continuing to shrink, why waste limited training dollars on courses your workforce may not need? The Johnson Controls Training Institute can maximize your training investments by assessing your Facility O&M Staff Skills and working with your teams to identify the best development solutions to meet your facility performance goals.

The Johnson Controls Training Institute has more than 60 years of success developing people to operate and maintain buildings. We assist large and small workforces in hospitals, education facilities, pharmaceutical companies, office buildings, utility companies, and government facilities.

Our services are customized for your needs and typically include the steps below:

STEP 1: Review Facility Strategies and Desired Outcomes
STEP 2: Complete Site-specific Skill Assessments by Job Roles
STEP 3: Analyze Root Causes of Staff Performance Gaps
STEP 4: Design and Deploy Solutions and Development Maps
STEP 5: Assess Outcomes and Track Results on Scorecards

For more information or to review examples of our assessment and development services, **visit www.johnsoncontrols.com/institute** or contact our Facility O&M Development professionals at 800-524-8540.

Our site-specific Skill Assessments are detailed to ensure an accurate review of your Facility O&M staff skills by job role. These can be self-assessments, supervisor-assessments, online testing, and/or hands-on performance assessments based on your facility needs. Any technical, customer service, or leadership job roles and skills can be assessed. Below are a few examples of client job roles.

- HVAC & Equipment Technicians
- Control & Automation Technicians
- Control & Automation Engineers
- Energy Management Specialists
- Work Management & Facility Analysts
- Utility Plant & Boiler Operators
- Facility Operators & Facility Controllers
- Electricians & Telecommunication Techs
- Steamfitters & Sheet Metal Workers
- Pipefitters & Stationary Engineers
- Plumbers & Refrigeration Mechanics
- Carpenters, Locksmiths, & Painters
- Building Engineers & Facility Engineers
- Operation & Maintenance Specialists
- Safety Coordinators & Groundskeepers
- Security and Fire System Technicians
- Service Coordinators & Billing Specialists
- Maintenance Management System Administrators
- Operation & Maintenance Supervisors
- Facility Managers & Directors

We work with your teams to design solutions and development maps for your facility needs. These solutions may include hands-on training, self-study learning, on site coaching, project assignments, O&M strategy updates, process improvements, organization updates, rewards, new equipment, performance support tools and cheat sheets.

HOW TO ENROLL IN A COURSE

Enroll Online

Register and purchase trainings online with credit cards, all at one location. **www.jcitraininginstitute.com**

View Our Course Schedule

Check classes that are open for enrollment and check the current status of a class. **www.johnsoncontrols.com/institute**

Browse Courses

Visit **www.johnsoncontrols.com/institute** for new classes and special discounts.

JOHNSON CONTROLS TRAINING INSTITUTE: COURSE APPLICATION

We encourage you to register for classes online at: **www.jcitraininginstitute.com**. This form should be used by those unable to register online, such as government agencies, and Johnson Controls branch offices. You can fill the form out then print this page and either email (**cg-customer.registrar@jci.com**) or fax (877-403-6625) it to the Johnson Controls Training Institute.

Student Information

Name of Applicant (Please Print)

Student E-mail Address (REQUIRED FOR CONFIRMATION / CANCELLATION NOTIFICATION)
Please provide a unique email address for each applicant.

Company/Organization Name

Company/ Organization Address (No P.O. Box)

City State Zip

Telephone Number ( ) - Fax Number ( ) -

Course Registration Information

Course Name

Course # Location

First Choice Date

Second Choice Date

Prerequisite Course Completion Date

Payment must be received 10 days prior to course start date.

◯ **Early Payment Discount** of $100 for each student's tuition if full payment is received 30 days prior to the start of the course.
****Early Payment Discount does NOT apply to any voucher payments or distance learning or to course #4720 or #1100 Verasys Engineering and Configuration.****

◯ **5-pack** ◯ **10-pack** ◯ **Personal Passport 3-pack Course Vouchers:** See page 5 for details

Payment Method Selected:

◯ Visa® or ◯ MasterCard® or ◯ American Express®

Exp. Date

_____ (Signature)

(Email address to send receipt)

◯ Check for $ (in U.S. Currency), payable to Johnson Controls Training Institute.

Please attach check and application together. Note: current prices may change.

Payment Policy
Please include check or credit card information with your application. To mail your application and payment, use Institute address (below).
Thank you.

Tax Deduction
U.S. Treasury Regulation 1.162.5 permits an income tax deduction for educational expenses incurred to maintain or improve professional skills. Consult your tax advisor for details.

For Johnson Controls Branch Use Only

Installation Contract #

Salesperson Name

Cancellation Policy

Refunds are issued only if you notify the Institute at 414-524-4286 or 800-524-8540 that you cannot attend, no less than fourteen days prior to the start of the course. You are liable for the entire course fee if cancellation is received after this deadline; you may substitute another student, or enroll in another session. Johnson Controls reserves the right to cancel classes and assumes no liability for expenses. All registrants will be notified at least ten days before the start of class.

Mail form and payments to:
Johnson Controls Training Institute/M45
507 East Michigan Street
Milwaukee, WI 53202

Telephone:
414-524-4286
800-524-8540

Fax:
877-403-6625

Internet:
www.johnsoncontrols.com/institute

For End Users and/or Authorized Building Controls Specialists/Contractors Only.

Johnson Controls Institute 2018 Class Schedule

January – June (July – December on reverse side)

FOR MORE INFORMATION: **www.johnsoncontrols.com/institute**

These dates are subject to change. Please verify the dates and location and look for new course offerings at www.jcitraininginstitute.com

Course Name	Course #	Page #	Start-End (Days)	Course Fee	January				February				March				April					May				June			
					8	15	22	29	5	12	19	26	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25
HVAC COURSES																													
HVAC Mechanical Systems	210	13	M-F	$1,670				PHX							MKE														
Fundamental Control Strategies for HVAC Systems	215	13	M-F	$1,670						TAM						BAL				MKE				TAM					
HVAC Pneumatic Controls - Multi Manufacturer	221	14	Tu-Th	$1,520																							MKE		
HVAC Equipment Maintenance	225	14	Tu-Th	$1,520							PHX																		
Series II VFD Commissioning Certification Training - JCI/Eaton	233	24	TH	$500									SHRB										MKE						
OptiView™ Control Panel	2100	15	Tu-W	$1,270	TAM																		SHRB						
YK High Pressure Centrifugal Operations/Maintenance	2102	15	Tu-Th	$1,520									TAM									HOU							
YCAV Air Cooled Rotary Screw Liquid Chillers	2103	16	Tu-Th	$1,520											SHRB							MKE						PHX	
Absorber Operations/Maintenance	2104	16	Tu-Th	$1,520																						SHRB			
YS/YR Rotary Screw Chillers	2105	17	Tu-Th	$1,520								PHX																	
YCAS Air Cooled Rotary Screw Liquid Chillers	2106	17	Tu-W	$1,270													PHX												
YT/YK Centrifugal Chiller and Compressor Overhaul	2107	18	M-F	$2,570																SHRB									
YPAL Series 100 Package RTU	2108	18	Tu-Th	$1,520																				PHX					
YVAA Air Cooled Screw Chiller	2111	19	Tu-Th	$1,520																HOU									
YVWA Water Cooled Screw Chiller	2112	19	Tu-W	$1,270																			PHX						
YLAA Chiller Start-up & Troubleshoot	2114	20	Tu-Th	$1,520														SHRB											
BUILDING AUTOMATION SYSTEMS COURSES																													
Metasys® HVAC ASC Engineering	353	24	M-Th	$1,670					PHX																			TAM	
Metasys® DX-9100 Engineering	364	25	M-F	$1,930											MKE														
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Metasys® HVAC ASC Operations/Troubleshooting	381	26	M-F	$1,820																	MKE								
Metasys® System Extended Architecture for Building Operators	388	26	M-W	$1,520				HOU MKE	LOU		TAM	BOS	LA		DAL PHX				HOU	BAL		TAM	DAL			MKE	BOS PHX	IND	
Metasys® System Extended Architecture for Building Engineers	389	27	M-F	$1,820				HOU MKE	LOU		TAM	BOS	LA		DAL PHX				HOU	BAL		TAM	DAL			MKE	BOS PHX	IND	
Metasys® System Extended Architecture Engineering and Setup	391	27	M-F	$1,930								MKE																	
Metasys® Extended Architecture Advanced Engineering	397	28	Tu-Th	$1,520																									
Verasys® Technical Training	1100	31	W-Th	$500					MKE										BAL										PHX
Metasys® FEC Operations/Troubleshooting	4703	28	Tu-Th	$1,520				DAL		LOU						PHX		BAL								IND			MKE
Metasys® FEC Custom Programming	4704	29	Tu-Th	$1,520						IND													IND						
Metasys® FEC Systems Engineering	4707	29	Tu-Th	$1,520						DAL			BAL	IND		LOU	MKE				PHX					LA			
Facility Explorer® (FX) MSTP Field Controller Engineering	4714	30	M-F	$1,870									BOS			TAM						LOU					MKE		
Metasys® System Extended Architecture Hardware and Troubleshooting	4718	30	M-F	$1,880																		BOS							
Facility Explorer® (FX) Supervisory Controllers Engineering Certification	4720	31	M-F	$2,450					BOS													BAL							
INSTRUCTOR LED DISTANCE LEARNING & eLEARNING COURSES																													
Advanced PCT Programming	3001	35	Tu-Th	$950					DL																				DL
Metasys® Graphics Generation Tool	3002	35	Tu-Th	$950										DL														DL	
Metasys® User Interface Overview	3003	36	Tu	$395	DL												DL												
Configuring the Metasys® UI Database	3004	36	Th	$395	DL												DL												
Security Field Controllers Configuration and Maintenance	4203	37	16hrs	$250																									
SECURITY SOLUTIONS COURSES																													
P2000 Security Management Systems Configuration	4002	33	M-Th	$1,670											BAL														LA
P2000 Operations with Video Imaging	4223	33	M-Tu	$1,270																			LA						

KEY for INSTITUTE LOCATIONS: BAL (Baltimore) • BOS (Boston) • DAL (Dallas) • DL (Distance Learning) • HOU (Houston) • IND (Indianapolis) • MKE (Milwaukee) • PHX (Phoenix) • SC (Southern California) • SHRB (Shrewsbury) • TAM (Tampa)

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Johnson Controls Institute 2018 Class Schedule

July – December (January – June on reverse side)

FOR MORE INFORMATION: **www.johnsoncontrols.com/institute**

These dates are subject to change. Please verify the dates and location and look for new course offerings at www.jcitraininginstitute.com

Course Name	Course #	Page #	Start-End (Days)	Course Fee	July					August				September				October					November				December			
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Fundamental Control Strategies for HVAC Systems	215	13	M-F	$1,670			BAL				MKE				LA					IND		BAL				PHX				
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YK High Pressure Centrifugal Operations/Maintenance	2102	15	Tu-Th	$1,520				SHRB					DAL							MKE							TAM			
YCAV Air Cooled Rotary Screw Liquid Chillers	2103	16	Tu-Th	$1,520			DAL										DAL						PHX					SHRB			
Absorber Operations/Maintenance	2104	17	Tu-Th	$1,520																									LA	
YS/YR Rotary Screw Chillers	2105	16	Tu-Th	$1,520				HOU																	SHRB					
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Metasys® System Extended Architecture for Building Engineers	389	27	M-F	$1,820		BAL				BAL LA TAM			HOU LOU MKE		TAM	DAL	BOS PHX	LA MKE	BAL IND TAM		DAL		BOS LOU	LA		IND PHX	HOU		BAL	
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Customer Training Catalog

2018

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