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Training Overview

The Commissioning Provider curriculum consists of three modules. Participants will learn fundamentals of the commissioning process, the technical elements of commissioning; including operational knowledge of the individual systems and equipment components and analytical skills required to determine system and equipment optimization. Courses may also be taken a-la-carte for continuing education purposes.

Continuing Education Credits

Courses may be taken as part of an entire track, or a-la-carte. All courses are eligible for Continuing Education Credits through the American Institute of Architects (AIA). Continuing education pricing for each course is included after the course description.
Module 1 – Fundamentals of Commissioning

In this module, participants will learn fundamental processes of commissioning for new and existing buildings. The module content focuses on phases of the commissioning process, commissioning procedures, required documentation and project deliverables. (2 courses, 17 lessons, approximately 6 instructional hours)

Course 1: New Construction Building Commissioning

This course provides instruction on the phases of new construction building commissioning including pre-design, design, design review and specifications and construction (submittals, site observations, functional performance testing and document review). Course content also covers O&M training and operation and occupancy phases.

Lesson 1: Pre-Design Phase
Lesson 2: Design Phase – Cx Plan
Lesson 3: Design Review & Specifications
Lesson 4: Construction Phase–Submittal Review
Lesson 5: Construction Phase–Site Observations
Lesson 6: Construction Phase—Functional Performance Testing
Lesson 7: Construction Phase—Document Review
Lesson 8: O&M Training
Lesson 9: Operation & Occupancy Phase

After completing these lessons, participants will be able to identify all phases of commissioning for new construction and describe the basic commissioning activities that are performed in each phase.

Individual CEUs and Course Price: 2 AIA LU/HSW; – $ 140

Course 2: Existing Building Commissioning

This course provides instruction on the phases of existing building commissioning (EBCx) including scoping & planning, building walk-through, the EBCx plan, investigation, implementation, handoff and ongoing commissioning.

Lesson 1: Scoping & Planning Phase–Goals & Documents
Lesson 2: Scoping & Planning Phase–Building Walk-Through
Lesson 3: EBCx Plan
Lesson 4: Investigation Phase–Reviewing & Interviewing
Lesson 5: Investigation Phase–Analyzing Facility Performance
Lesson 6: Investigation Phase–Testing, Monitoring & Reporting
Lesson 7: Implementation Phase
Lesson 8: Handoff Phase–Training, System Manuals & Reporting
Lesson 9: Ongoing Commissioning Phase
After completing these lessons, participants will be able to identify all phases of existing building commissioning, describe the commissioning activities performed in each phase and outline a successful EBCx plan.

**Individual CEUs and Course Price:** 3.75 AIA General LUs; – $265

### Module 2: Commissioning Systems & Equipment

In this module, participants will learn the fundamentals of building system and equipment operations and describe the various types of building systems and equipment and how these systems operate. This module discusses the building thermal envelope, facility operating requirements, facility energy considerations and energy analysis. Participants will be introduced to mechanical systems and equipment, including air handling units, chilled water systems, hot water and steam heating, boilers, chillers, domestic water systems, electrical systems and equipment and control systems. Participants in this module will be able to identify and describe the basic operation of building systems and equipment. (13 courses, 54 lessons, approximately 19 instructional hours)

**Course 1: Facility Envelope Components**

This course provides instruction on exterior building systems, facility envelope components, and the typical construction drawings. Thermal characteristics, below grade and wall systems and fenestration and roofing systems are thoroughly described.

Lesson 1: Building Thermal Envelope
Lesson 2: Building Thermal Envelope–Thermal Characteristics
Lesson 3: Building Thermal Envelope–Below Grade & Wall Systems
Lesson 4: Building Thermal Envelope–Fenestration & Roofing Systems

After completing these lessons, participants will be able to identify and describe all components of the building envelope including foundations, glazing, windows, doors, walls and roofing. Participants will be able to discuss characteristics of the building thermal envelope such as R-values, U-values and moisture control.

**Individual CEUs and Course Price:** 1 AIA General LUs; – $70

**Course 2: Operating Requirements**

This course provides instruction on facility operating requirements, including occupancy and facility characteristics and typical room conditions.

Lesson 1: Occupancy & Facility Characteristics
Lesson 2: Room Conditions

After completing these lessons, participants will be able to list facility classifications, explain occupancy schedules and list typical factors that influence room conditions, such as temperature, humidity, pressure and lighting levels.

**Individual CEUs and Course Price:** 1 AIA General LUs - $70

**Course 3: Facility Energy Considerations**

This course provides instruction on facility energy considerations including design conditions and weather data, energy reduction requirements, regulations and incentives, energy analysis and energy economic calculations.

Lesson 1: Design Conditions & Weather Data
Lesson 2: Energy Reduction Requirements, Regulations & Incentives
Lesson 3: Energy Analysis
Lesson 4: Energy Economic Calculations

After completing these lessons, participants will be able to describe how weather data is used for basic energy analysis activities, identify energy reduction requirements and guidelines and perform basic energy economics calculations.

*Individual CEUs and Course Price: 1.75 AIA LU/HSW; – $125*

**Course 4: Introduction to Mechanical Systems & Equipment**
This course provides an introduction to mechanical systems and equipment, including mechanical drawings, fan terms, types and configurations, pump components and characteristics, heat exchanger types and characteristics, motor fundamentals, motor types and efficiencies, variable frequency drive (VFD) applications and characteristics, as well as piping systems and accessories.

Lesson 1: MEP Fundamentals - Mechanical Drawings
Lesson 2: Fan Terms, Types & Configurations
Lesson 3: Pump Components & Characteristics
Lesson 4: Heat Exchanger Types & Characteristics
Lesson 5: Motor Fundamentals
Lesson 6: Motor Types and Efficiencies
Lesson 7: Variable Frequency Drive Applications & Characteristics
Lesson 8: Piping Systems & Accessories

After completing these lessons, participants will be able to describe the uses of mechanical drawing and documents and define and explain mechanical terminology such as fan laws, pump curves, motor efficiencies, open and closed loop piping systems, as well as expansion and compression systems.

*Individual CEUs and Course Price: 2.75 AIA General LUs; – $195*

**Course 5: Mechanical Systems & Equipment – Air Handling Equipment**
This course provides instruction on air handling equipment including psychrometric analysis, air handler components and configuration, make-up air and heat recovery systems, and terminal air flow devices.

Lesson 1: Air Handling Equipment
Lesson 2: Principles of Psychrometrics
Lesson 3: Psychrometric Analysis
Lesson 4: Air Handler Components & Configuration
Lesson 5: Make-up Air & Heat Recovery Systems
Lesson 6: Duct Terminal Air Flow Devices
Lesson 7: Room Terminal Air Flow Devices
After completing these lessons, participants will be able to identify and describe the fundamental components of air handling equipment and describe influencing factors such as psychrometric airflow, sensible and latent heat, mixed air conditions, coil performance and supply air conditions.

**Individual CEUs and Course Price: 2.5 AIA LU/HSW; – $175**

**Course 6: Mechanical Systems and Equipment – Cooling Equipment**
This course provides instruction on cooling equipment including unitary cooling equipment, evaporative cooling equipment, chillers and cooling towers.

Lesson 1: Principles of Vapor Compression Refrigeration
Lesson 2: Unitary Cooling Equipment
Lesson 3: Evaporative Cooling Equipment
Lesson 4: Chillers and Cooling Towers 1
Lesson 5: Chillers and Cooling Towers 2

After completing these lessons, participants will be able to identify the basic components and characteristics of cooling equipment such as vapor compression refrigeration, heat pump operation, direct and indirect evaporative cooling and water-side economizers. Participants will also be able to discuss operation and maintenance considerations for evaporative condensers, chillers and cooling towers.

**Individual CEUs and Course Price: 1.75 AIA LU/HSW; – $125**

**Course 7: Combustion & Boilers**
This course provides instruction on heating equipment, including furnaces and heaters.

Lesson 1: Heating Equipment
Lesson 2: Furnaces & Heaters

After completing these lessons, participants will be able to explain the process of combustion and describe components, operations and efficiencies of boilers, warm air furnaces, space heaters, unit heaters and radiant heaters.

**Individual CEUs and Course Price: 1 AIA General LUs; – $70**

**Course 8: Chilled Water Systems**
This course provides instruction on hydronic heating and cooling and describes condenser water systems.

Lesson 1: Hydronic Heating & Cooling
Lesson 2: Describe Condenser Water Systems

After completing these lessons, participants will be able to explain the layout and components of major chilled water systems, diagram a condenser water system and discuss operation and maintenance considerations of chilled water systems.

**Individual CEUs and Course Price: 1 AIA General LUs; – $70**

**Course 9: Hot Water & Steam Heating**
This course provides instruction on hot water heating systems and steam systems.

Lesson 1: Hot Water Heating Systems 1
Lesson 2: Hot Water Heating Systems 2
Lesson 3: Steam Systems 1
Lesson 4: Steam Systems 2

After completing these lessons, participants will be able to diagram hot water heating systems and explain hot water and steam system considerations and components, such as water temperature, terminal heating units, condensate return systems, and operation and maintenance considerations of hot water heating and steam systems.

*Individual CEUs and Course Price: 1.25 AIA General LUs; – $90*

**Course 10: Domestic Water Systems**

This course provides instruction on domestic water distribution systems and domestic hot water (DHW) systems.

Lesson 1: Domestic Water Distribution Systems
Lesson 2: Domestic Hot Water Systems

After completing these lessons, participants will be able to describe water-consuming fixtures and water-saving features, circulation, controls systems, solar water heating systems and identify key components and discuss operation and maintenance considerations for water distribution and DHW systems.

*Individual CEUs and Course Price: 1 AIA LU/HSW; – $70*

**Course 11: Electrical Systems and Equipment**

This course provides instruction on electrical drawings and documents, electrical distribution systems, lighting systems, lighting controls and renewable energy systems.

Lesson 1: Electrical Drawings & Documents
Lesson 2: Electrical Distribution Systems 1
Lesson 3: Electrical Distribution Systems 2
Lesson 4: Lighting Systems
Lesson 5: Lighting Controls
Lesson 6: Renewable Energy Systems

After completing these lessons, participants will be able to use electrical drawings and documents to locate electrical components and determine system operation and electrical load capacity. Participants will also be able to list and explain various terms and principles for lighting systems, controls and solar photovoltaic systems.

*Individual CEUs and Course Price: 1.75 AIA LU/HSW; – $125*

**Course 12: Control System Fundamentals**

This course provides an overview of control system terms, types of control systems, modes of operation and control system elements.

Lesson 1: Control System Terms
Lesson 2: Types of Control Systems
Lesson 3: Modes of Operation
Lesson 4: Control System Elements

After completing these lessons, participants will be able to define and explain the terms, elements, process, actions and elements of controls and controls systems, identify key characteristics of electronic, pneumatic, and (DDC) controls systems and discuss key operational features of controls including on-off, floating and proportional and the various modes of controls.

*Individual CEUs and Course Price: 1.75 AIA LU/HSW; – $125*

**Course 13: Control Systems**

This course provides instruction on DDC systems and control system drawings and documents.

Lesson 1: DDC Systems 1
Lesson 2: DDC Systems 2
Lesson 3: Control System Drawings & Documents

After completing these lessons, participants will be able to discuss distinguishing features and capabilities of direct digital DDC controls including system controllers, controls system versions and capacities, as well as using controls for trending and monitoring. Participants will also be able to describe network and system architecture and read and write a control’s sequence of operations.

*CEUs and Course Price: 1 AIA LU/HSW; – $70*
Module 3 – Systems Performance & Analysis

In this module, participants will learn the performance of the building operation and system design. This module emphasizes the analysis of air distribution systems, hydronic heating and cooling systems, electrical systems, control systems, functional performance testing, system evaluation and installation requirements. Participants will be able to identify the building’s operational system design and diagnose common issues and resolutions. (9 courses, 33 lessons, approximately 12 instructional hours)

Course 1: Design Review

This course provides instruction on mechanical, plumbing and electrical design review.

Lesson 1: Mechanical Design Review
Lesson 2: Plumbing Design Review
Lesson 3: Electrical Design Review

After completing these lessons, participants will be able to explain several of the most common construction document review items for mechanical, electrical and plumbing systems.

CEUs and Course Price: 1 AIA LU/HSW; – $70

Course 2: Mechanical System Analysis – Air Distribution Systems

This course provides instruction on the analysis of packaged HVAC equipment, air moving equipment, duct design and space airflow and general exhaust.

Lesson 1: Analysis of Packaged HVAC Equipment
Lesson 2: Analysis of Air Moving Equipment
Lesson 3: Analysis of Duct Design
Lesson 4: Analysis of Space Airflow & General Exhaust

After completing these lessons, participants will be able to explain equipment analysis methodology, identify installation related deficiencies, recognize common programming and setup errors and identify deficiency resolutions of air distribution systems.

CEUs and Course Price: 1.25 LU/HSW; – $90

Course 3: Mechanical System Analysis – Hydronic Heating and Cooling

This course provides instruction on analysis of chilled water systems, hot water heating systems, hydronic piping systems, hydronic pumping systems and terminal units.

Lesson 1: Analysis of Chilled Water Systems
Lesson 2: Analysis of Hot Water Heating Systems
Lesson 3: Analysis of Hydronic Piping Systems
Lesson 4: Analysis of Hydronic Pumping Systems & Terminal Units

After completing these lessons, participants will be able to explain common evaluation approaches to heating and cooling systems along with common deficiencies and resolutions. Participants will also be able to identify piping and pumping installation and operational issues and resolutions.

CEUs and Course Price: 1 AIA LU/HSW; – $70
**Course 4: Mechanical System Analysis – Testing, Adjusting and Balancing**
This course provides instruction on testing, adjusting and balancing of air and water systems.

Lesson 1: Air Testing, Adjusting & Balancing
Lesson 2: Air Testing, Adjusting & Balancing Issues
Lesson 3: Water Testing, Adjusting & Balancing
Lesson 4: Water Testing, Adjusting & Balancing Issues

After completing these lessons, participants will be able to explain purpose of air and water testing, adjusting and balancing along with procedures and reporting. Participants will also be able to analyze system performance and identify deficiencies and resolutions.

*CEUs and Course Price: 1 AIA LU/HSW; – $70*

**Course 5: Electrical System Analysis**
This course provides instruction on the analysis of electrical distribution systems, lighting systems and photovoltaic systems.

Lesson 1: Analysis of Electrical Distribution Systems
Lesson 2: Analysis of Lighting Systems
Lesson 3: Analysis of Photovoltaic Systems

After completing these lessons, participants will be able to identify installation and operational deficiencies and resolutions of electrical, lighting and photovoltaic systems.

*CEUs and Course Price: 1 AIA LU/HSW; – $70*

**Course 6: Control System Analysis – Direct Digital Controls (DDC)**
This course provides instruction on direct digital controls, energy efficiency control strategies, DDC installation and programming issues and DDC sensor installation and operational issues.

Lesson 1: Direct Digital Controls
Lesson 2: Energy Efficiency Control Strategies
Lesson 3: DDC Installation and Programming Issues
Lesson 4: DDC Sensor Installation & Operational Issues

After completing these lessons, participants will be able to explain the different types of DDC controls and explain energy efficiency controls strategies, including time-of-day programming, duty cycling and demand limiting and response. Participants will also be able to explain point-to-point installation checkout and discuss hardware and programming issues.

*CEUs and Course Price: 1.5 AIA LU/HSW; – $105*

**Course 7: Control System Analysis – Air Handling Units and Hydronic Systems**
This course provides instruction on the analysis of duct static pressure and variable air volume (VAV) terminal control, VAV reheat and supply air temperature control, economizer control and analysis of outside air control.

Lesson 1: Analysis of Duct Static Pressure and VAV Terminal Control
Lesson 2: Analysis of VAV Reheat & Supply Air Temp Control
Lesson 3: Economizer Control
Lesson 4: Analysis of Outside Air Control
After completing these lessons, participants will also be able to explain the analysis and identify operational deficiencies and resolutions of duct performance, VAV reheat and supply air temp controls, economizer controls and outside air control.

*CEUs and Course Price: 1.5 AIA LU/HSW; – $105*

**Course 8: Functional Performance Testing**
This course provides instruction on functional performance test development for HVAC, plumbing, electrical and lighting.

Lesson 1: Functional Performance Test Development: HVAC
Lesson 2: Functional Performance Test Development: Plumbing
Lesson 3: Functional Performance Test Development: Electrical
Lesson 4: Functional Performance Test Development: Lighting

After completing these lessons, participants will develop functional performance tests for heating, ventilating, air conditioning (HVAC), plumbing, electrical and lighting systems.

*CEUs and Course Price: 1.75 AIA LU/HSW; – $125*

**Course 9: System Evaluation**
This course provides instruction on monitoring, trending, analyzing, monitoring and evaluating system performance.

Lesson 1: Monitoring and Trending
Lesson 2: Analyzing Monitoring & Trending Results
Lesson 3: Measurement & Verification Fundamentals Compare

After completing these lessons, participants will be able to describe the purpose of monitoring, trending, basic data types, sources and parameters for trend data and compare trending and monitoring analysis tools and explain trending points for identifying performance issues. Participants will also be able to record system data, measurements and verify performance.

*CEUs and Course Price: 1.5 AIA LU/HSW; – $105*