

AC Systems

This course is designed to provide advanced background information to facilitate isolating and correcting problems with industrial electrical distribution, controls, and AC power conditioning systems. This course builds upon the introduction level course but that course is not required as long as participants have a basic understanding of industrial AC systems.

Objective

The objective of this course is to provide a somewhat experienced industrial electrical worker with a more in-depth understanding of the troubleshooting and maintenance of AC distribution, control, maintenance, and conditioning systems.

Who Should Attend

This course is designed to benefit individuals who have a background in or experience with industrial AC systems. It is also recommended for those interested in industrial AC systems.

Course Content

- History of electrical AC systems – knob and tube to today's NEC requirements
- Power management and pricing
- Transfer switches
- Surge protection
- Metering
- Current Transformers (CT's)
- Switchboards
- Busways
- Circuit breaker operation and maintenance

Course length: 3 days

CEU credits: 2.4

Fee: \$599



AC/DC - Industrial Electricity

This course covers the basics of AC and DC electricity through the study of basic AC current with emphasis on resistors, inductors, capacitors, transformers, electrical quantities, and units of measure. Industrial-grade training equipment is utilized to augment the hands-on portion of the course.

Objective

This course will teach the concepts behind Ohm's law, and Kirchoff's voltage and current laws. Other areas include power factors and power factor corrections as well as OSHA safety lockout/tagout procedures. DC current will be covered to gain an understanding of the benefits of both AC and DC systems.

Who Should Attend

This course is designed to benefit maintenance technicians, systems technicians, engineers, supervisors in maintenance or any staff involved with the support of electrical systems.

Course Content

- Electrical safety, arc flash, and lockout/tagout
- Electrical components and measuring instruments
- Ohm's Law - voltage, current and resistance in electric circuits
- Resistors, capacitors, and inductors
- Relays and solenoids
- Diodes, SCR's and rectification
- Protective devices – fuses and circuit breakers
- Wires and NEC Requirements
- Series/Parallel circuits
- Ladder logic
- Transformers
- Industrial electrical symbols

Course length: 3 days

CEU credits: 2.4

Fee: \$599



Intro to Electrical Motors 200, DC Motors 230,
AC Motor Applications 240

Calibration

This course is designed to provide advanced background information to increase the understanding of Instrumentation- the monitoring and controlling of processes. This course provides advanced experience with the calibration of sensors and transducers – both 'dumb' and 'smart'. This course builds upon the introduction level Sensors and Transducers course but that course is not required as long as participants have a basic understanding of industrial Instrumentation systems. Industrial training equipment will be utilized to augment the hands-on portion of the course.

Objective

This course is designed to teach advanced principles of industrial instruments calibration and provides a technician advanced level information. This course will provide the participant with the skills to gain a more in depth understanding of instrumentation calibration, calibration terminology, calibration equipment, and calibration technique.

Who Should Attend

This course is designed to benefit maintenance technicians, systems technicians, engineers, and supervisors in maintenance or any staff that want to increase their understanding and skill in calibrating instrumentation systems. This course builds upon the introduction level Sensors and Transducers course but that course is not required as long as participants have a basic understanding of industrial instrumentation systems.

Course Content

- Overview of temperature, pressure, and weight calibration
- 4-20mA current and calibration of 'dumb' transmitters – 'zero' and 'span'
- Calibration of 'smart' transmitters using a Fluke calibrator and a HART Communicator
- Hands on exercises to calibrate 'dumb' and 'smart' temperature transmitters using RTD's and thermocouples
- Hands on exercise with a calibrated paddlewheel flow sensor
- Calibration of 'smart' and 'dumb' ultrasonic level sensors
- Calibration of differential pressure transmitter

Course length: 3 days

CEU credits: 2.4

Fee: \$599



“The classes have been great thus far and I am looking forward to other classes. The instructors have been very good at helping everyone's individual needs.”

**Evraz Rocky Mountain Steel
Mechanical Maintenance Technician
Apprenticeship Participant**

Combustion Theory

This course is designed to provide a background in understanding the principles of burning gas (natural gas, propane, and butane) in industrial re-heat furnaces and residential furnaces. The burners and controls needed to achieve stoichiometric (complete) combustion are analyzed. Hands-on labs provide experience in using a digital manometer to determine flue and air distribution flow and pressures and setting gas supply pressures, and a combustion gas analyzer to determine CO₂, H₂O and CO content. Provide an understanding of methods used to increase increasing furnace efficiency.

Objective

The objective of this course is to provide somewhat experienced industrial electrical worker and HVAC workers with a more in-depth understanding of the theory of efficiently burning gas in furnaces – to enhance their installation, set-up and maintenance skill of these systems.

Who Should Attend

This course is designed to benefit individuals who have a background in or experience with industrial re-heating systems and HVAC workers.

Course Content

- Heating with gas basics
- Principles of gas combustion – methane, propane, and butane
 - Stoichiometric combustion
- Gas furnaces – traditional, mid-efficiency and high efficiency
- Gas burners – achieving a blue flame, excess air
- Gas controls and valves
- Gas ignition systems
- Safety and operating controls for furnaces
- Hands on using digital manometers and gas analysis meters on furnaces

Course length: 3 days

CEU credits: 2.4

Fee: \$599



Communication Systems

Communication Systems are the electronic interfaces used by computers, controllers, and instruments to exchange information. There are many layers of technology required to implement communications: human interface, timing and sequencing, data collection, messaging, cabling and connections, etc. All industries use some type of communication system businesses.

Objective

This course is designed to teach the principles of communication systems and provides a technician-level approach to the field of Communications. This course will provide the participant with the skills to gain a more in depth understanding of the theories of data and signal preparation and integrity, basic computer interfaces, controller and instrumentation interfaces, and interconnections (cabling and fiber optics).

Who Should Attend

This course is designed to benefit maintenance technicians, systems technicians, engineers, supervisors in maintenance or any staff involved with the support of communications systems.

Course Content

- PLC communications overview – Ethernet, Data Highway, ControlNet – using RSLinx
- Character and signal encoding
- Data integrity and error correction
- Instrumentation interface (4-20mA loops and fieldbus)
- Serial interfaces (RS-232, USB)
- Ethernet and CAT-5 cabling
- Fiber optic cables and fiber optic termination
- Coax cables
- DeviceNet
- Data highway
- PA systems – Gaitronics phone

Course length: 2 days

CEU credits: 1.6

Fee: \$439



Control Devices

This course is designed to provide advanced background information to increase the understanding of Instrumentation-the monitoring and controlling of processes. This course provides advanced experience with Control Devices, material analysis sensors, measuring motor speed, limit switches, proximity sensors, photo sensors, light curtains, PID controllers, electrohydraulic positioners, and proportional valves. This course builds upon the introduction level Sensors and Transducers course but that course is not required as long as participants have a basic understanding of industrial Instrumentation systems. Industrial training equipment will be utilized to augment the hands-on portion of the course.

Objective

This course is designed to teach advanced principles of industrial instruments and control systems and provides a technician-level approach to the field of Instrumentation. This course will provide the participant with the skills to gain a more in depth understanding of monitoring operations, processes and equipment through instrumentation, develop troubleshooting and calibration skills at the device and system level, gain a increased understanding of PID controllers operation and balancing.

Who Should Attend

This course is designed to benefit maintenance technicians, systems technicians, engineers, and supervisors in maintenance or any staff that want to increase their understanding and skill in using/maintaining instrumentation systems. This course builds upon the introduction level Sensors and Transducers course but that course is not required as long as participants have a basic understanding of industrial Instrumentation systems.

Course Content

- Material analysis sensors
- Data transmission and digital communication
- Encoders, resolvers, and tachometers
- Limit switches and proximity sensors
- Photo sensors and light curtains
- Using and balancing of PID controllers
- Electrohydraulic positioners – REXA and Rotork
- Boilers and boiler controls
- Safety valves

Course length: 3 days

CEU credits: 2.4

Fee: \$599



DC Systems

This course is designed to provide advanced background information to facilitate isolating and correcting problems with industrial DC electrical distribution, DC motor controls, controls, DC Cranes, and DC power conditioning systems. This course builds upon the introduction level course but that course is not required as long as participants have a basic understanding of industrial DC systems.

Objective

The objective of this course is to provide a somewhat experienced industrial electrical worker with a more in-depth understanding of the troubleshooting and maintenance of AC distribution, control, maintenance, and conditioning systems.

Who Should Attend

This course is designed to benefit individuals who have a background in or experience with industrial DC systems. It is also recommended for those interested in industrial DC systems.

Course Content

- DC motors – brush and armature maintenance
- DC cranes – print reading and operation
- DC drives
- DC power systems – 3 phase rectification

Course length: 3 days

CEU credits: 2.4

Fee: \$599



Electrical Print Reading

Objective

This course will introduce students to the basic principles and concepts of electrical print reading; standard electrical symbols, one-line diagrams, wiring diagrams, Piping and Instrumentation Diagrams (P&ID's) and common industrial control circuits. Emphasis is placed on basic print reading techniques from the standpoint of using electrical diagrams together with their specific symbols, components and applications. Your company's prints can be incorporated into the class and used as a learning exercise – giving the employee increased knowledge of your specific processes or tools. Hands-on exercises will be utilized to gain further understanding and to improve troubleshooting skills.

Who Should Attend

This course is designed for the person who is in an industrial or electronics setting that requires a working knowledge in electrical prints and schematics. Electrical technicians, maintenance technicians, millwrights, or electro/mechanical technicians at all levels will benefit from this course.

Course Content

- Symbols – review electrical components, instrumentation, logic, and interconnections
- Pictorial and Wiring diagrams – different ways to present the same data
- One-line diagrams – upper level and block diagrams including power distribution, industrial controls circuits, PLC connections
- Relay/ladder logic diagrams – common method for diagramming used for most industrial controls
- Piping and Instrumentation Diagrams (P&ID's) – diagram methods used to portray most industrial automated processes - showing process measuring instruments, electrical interconnects, process material piping, controllers, and valves and other control devices
- Electrical schematics – reading electronics diagrams

Course length: 2 days

CEU credits: 1.6

Fee: \$439



Electricity for HVAC Workers

This course is designed to provide a background in understanding the basic principles of electrical safety, making electrical measurements, in using test equipment (multimeters, ammeters, digital manometers, and gas analysis meters), reading and understanding HVAC schematics and symbols, and understanding NEC wiring requirements. Hands-on labs provide experience in wiring and troubleshooting control circuits, using a digital manometer (to determine flue and air distribution flow and pressures and setting gas supply pressures), and a combustion gas analyzer to determine CO₂, H₂O and CO content.

Objective

The objective of this course is to provide plumbing and other non-electrical HVAC workers with basic electrical understanding and experience, to be able to perform basic HVAC electrical component troubleshooting and repair – using basic electrical measurement equipment.

Who Should Attend

This course is designed to benefit HVAC workers and/or plumbers who need to update their electrical skills.

Course Content

- Electrical Safety
- Ohm's law and using multimeters to measure Volts, Amps, and Ohms
- NEC wiring
- Electro-magnetism – solenoids, relays, and transformers
- Single Phase Motors and Start Capacitors
- Relay Ladder Logic
 - Symbols and Print Reading
 - Building and Troubleshooting Relay HVAC Control Circuits (Hands-On)
- Heating and Air-conditioning control circuits
- Hands on using digital manometers and gas analysis meters on furnaces

Course length: 3 1/2 days

CEU credits: 2.8

Fee: \$699



Electricity for Mechanical Technicians

This course is designed to provide you with background in understanding the basic principles of electrical safety, making electrical measurements, reading ladder logic schematics, PLC basics, and a basic understanding of motors, relays and transformers. Hands-on labs provide experience in wiring and troubleshooting control circuits, using a digital multimeter to measure Ohms, Volts, and Amps, and writing and loading simple PLC programs.

Objective

The objective of this course is to provide mechanical technicians (Millwrights) and other non-electrical workers with basic electrical understanding and experience. This should enable the mechanical technician to comfortably work with an electrical technician – performing troubleshooting of electromechanical systems as a team.

Who Should Attend

This course is designed to benefit mechanical technicians (Millwrights) and other non-electrical workers who need to update their electrical skills.

Course Content

- Electrical safety
- Ohm's Law
- Multimeters to measure volts, amps, and ohms
- Basic electromagnetism, relays, and transformers
- Electro-magnetism – solenoids, relays, and transformers
- Single Phase, DC, and three phase motors
- Relay Ladder Logic
 - Symbols and Print Reading
 - Building and Troubleshooting Relay HVAC Control Circuits (Hands-On)
- Simple PLC programming and downloads
- Hands on building /troubleshooting of relay logic circuits and PLC programming

Course length: 2 days

CEU credits: 1.6

Fee: \$439



Industrial AC Motors

This course introduces the theory and application of industrial-sized AC motors, their related control systems units of measure and construction. Industrial-grade training equipment will be utilized to augment the hands-on portion of the course. These lessons may apply to improve up-time and efficiencies at your facility.

Objective

This course teaches the practical application of single phase and 3-phase AC electric motors, their maintenance, protection, as well as control devices and motor control circuitry. Other areas explored include control relays, motor starters, and motor protection.

Who Should Attend

This course is designed to benefit maintenance technicians, systems technicians, engineers, supervisors in maintenance or any staff involved with the support of electrical systems.

Course Content

- Principles of magnetism and parts of a motor and generator
- Single phase AC motors
- 3-phase AC motors
- Basic relay and motor starter control circuits
- Understanding and reading nameplate data
- Motor protection & NEC requirements
- Motor types and motor selection
- Motor failures and troubleshooting
- Special AC motors – Wire wound rotor, synchronous motors, reactance motors, steppers and synchros
- AC Variable Frequency Drives (VFD)

Course length: 3 days

CEU credits: 2.4

Fee: \$599



Industrial DC Motors

This is an introduction to the theory and application of industrial DC motors. Their related control systems, construction and units of measure. The construction of DC motors includes series and shunt. The maintenance of DC motor brushes and commutator. The control and maintenance of industrial DC cranes is covered. These lessons can be applied to improve up-time and efficiencies at your facility.

Objective

This course teaches the practical application of DC electric motors, their maintenance and protection, as well as control devices and motor control circuitry.

Who Should Attend

This course is designed to benefit maintenance technicians, systems technicians, engineers, supervisors in maintenance or any staff involved with the support of DC Motors.

Course Content

- Electromagnetism and series and shunt DC motors
- Commutation
- Understanding replacing brushes and troubleshooting brush problems
- Understanding troubleshooting commutators and repairing them
- Understanding and reading DC Nameplate data
- Construction of DC motors, windings, and insulation
- Control and maintenance of industrial DC cranes
- Rectification of AC to DC
- DC motor Variable Frequency Drives (VFD)
- DC motors power, torque, and speed curves
- Brushless DC motors
- Control relays
- Motor starters/Motor protection

Course length: 3 days

CEU credits: 2.4

Fee: \$599



Instrumentation

This course is designed to provide advanced background information to increase the understanding of Instrumentation-the monitoring and controlling of processes. This course provides advanced experience with 4-20mA control loops, HART communication, temperature and pressure calibration, using and balancing PID controllers, and constructing, programming, and balancing a PLC (with a VFD, Temp Transmitter and 3-phase Fan) ladder logic PID controller. This course builds upon the introduction level Sensors and Transducers course but that course is not required as long as participants have a basic understanding of industrial Instrumentation systems. Industrial training equipment will be utilized to augment the hands-on portion of the course.

Objective

This course is designed to teach advanced principles of industrial instruments, control systems and provides a technician-level approach to the field of Instrumentation. This course will provide the participant with the skills to gain a more in-depth understanding of monitoring operations, processes and equipment through instrumentation, develop troubleshooting and calibration skills at the device and system level, and gain an increased understanding of PID controllers operation and balancing.

Who Should Attend

This course is designed to benefit maintenance technicians, systems technicians, engineers, and supervisors in maintenance or any staff that want to increase their understanding and skill in using/maintaining instrumentation systems. This course builds upon the introduction level Sensors and Transducers course but that course is not required as long as participants have a basic understanding of industrial Instrumentation systems.

Course Content

- Process control and PID controllers
- Optical sensors and proximity sensors
- Analyzers and safety devices
- Pressure and temperature calibration - calibration of 'dumb' transmitters – zero and span and calibration of 'smart' transmitters using a communicator
- Principles of level, temperature, pressure, and flow measurement
- Using a HART communicators
- Smart transmitters
- 4-20 ma loops, HART communications
- Wire a PLC, VFD, smart temperature transmitter and write and operate your own ladder logic
- PID controller program

Course length: 3 days

CEU credits: 2.4

Fee: \$599



Introduction to Electrical Troubleshooting

This course is designed to provide a background in understanding the basic principles of electrical safety, making electrical measurements, reading ladder logic schematics, PLC basics, and a basic understanding of motors, relays and transformers. Hands-on labs provide experience in wiring and troubleshooting control circuits, using a digital multimeter to measure Ohms, Volts, and Amps. Writing and loading simple PLC programs.

Objective

The objective of this course is to provide new electrical technicians with exposure to electrical measurements and topics.

Who Should Attend

This course is designed to benefit new electrical technicians with little electrical background and other non-electrical workers who need to update their electrical skills.

Course Content

- Troubleshooting and troubleshooting techniques
- Relay Ladder Logic
 - Symbols and print reading
 - Building and troubleshooting relay HVAC control circuits (Hands-On)
- Hands on labs with relay logic circuits
- Hands on labs with 3-phase motor control circuits understanding simple PLC programming and downloads
- Basics of PLC programming and downloading and running PLC programs

Course length: 2 days

CEU credits: 1.6

Fee: \$439



Medium and High Voltage Circuits

This course is designed to provide advanced background information to increase the understanding of medium and high voltage systems including safety, distribution, wiring, testing and maintenance. This course builds upon the introduction level Industrial AC/DC course but that course is not required as long as participants have a basic understanding of industrial AC systems.

Objective

The objective of this course is to provide a somewhat experienced industrial electrical worker with a more in-depth understanding of the troubleshooting and maintenance of medium and high voltage AC distribution, control, maintenance and conditioning systems.

Who Should Attend

This course is designed to benefit individuals who have a background in or experience with industrial AC systems. It is also recommended for those interested in industrial AC systems.

Course Content

- Definition of medium and high voltage
- Arc flash and OSHA analysis of a substation arc flash incident
- Switch gear and power distribution
- Motor control centers
- Conduit and cable trays
- Power cables and splicing power cables
- Circuit breaker testing and maintenance
- Power transformer maintenance – Doble Testing, DGA Testing

Course length: 3 days

CEU credits: 2.4

Fee: \$599



Motors and Controls - Industrial

This course introduces the theory and application of industrial-sized motors, their related control systems and units of measure. Industrial-grade training equipment will be utilized to augment the hands-on portion of the course. These lessons may be applied to improve up-time and efficiencies at your facility.

Objective

This course teaches the practical application of electric motors, their maintenance and protection, as well as control devices and motor control circuitry. Other areas explored include control relays, motor starters, and single-phase motors.

Who Should Attend

This course is designed to benefit maintenance technicians, systems technicians, engineers, supervisors in maintenance or any staff involved with the support of electrical systems.

Course Content

- Principles of magnetism and parts of a motor and generator
- Single phase AC motors
- DC Motors
- 3-phase AC motors
- Basic relay and motor starter control circuits
- Understanding and reading Nameplate data
- Motor Protection & NEC Requirements
- Motor types and motor selection
- Motor failures and troubleshooting
- AC and DC Variable Frequency Drives (VFD)

Course length: 3 days

CEU credits: 2.4

Fee: \$599



National Electrical Code – 2011 NEC Changes

The Economic and Workforce Development Division certifies that the participant meets the requirements to receive Professional Development Units (PDU's) in compliance with the Continuing Competency Program outlined by the State Electrical Board of Division Registrations of the Colorado Department of Regulatory Agencies. The PDU's are considered applicable to consumer protection and meet the core competencies of the designated topic as identified by the State Electrical Board.

Objective

Analyze the major electrical code changes in the 2011 National Electrical Code and how these changes affect today's electricians and electrical contractors.

Who Should Attend

Electricians that want to earn Professional Development Units (PDU's) toward renewing their State of Colorado Electricians License.

Course Content

Examine Article 230 and Article 250 of the 2011 NEC. Determine different load calculations and size conductors for grounding and bonding at services and at the load.

- General requirements
- Wiring and protection
- Grounding versus bonding
- Wiring methods and materials
- Equipment for general use
- Special occupancies
- Special equipment
- Special conditions
- Communications systems

Course length: 1 day

CEU credits: 0.8

Fee: \$249



National Electrical Code (NEC) - Electrical Theory and Calculations

The Economic and Workforce Development Division certifies that the participant meets the requirements to receive Professional Development Units (PDU's) in compliance with the Continuing Competency Program outlined by the State Electrical Board of Division Registrations of the Colorado Department of Regulatory Agencies. The PDU's are considered applicable to consumer protection and meet the core competencies of the designated topic as identified by the State Electrical Board.

Objective

Understand electrical theory and demonstrate the practical application of electrical calculations utilized in the electrical field including residential, industrial and commercial load calculations.

Who Should Attend

Electricians that want to earn Professional Development Units (PDU's) toward renewing their State of Colorado Electrician's License.

Course Content

Using Article 210 through Article 310 plus Article 430 of the 2011 National Electrical Code to gain a full understanding of electrical theory and how to size conductors correctly.

- Mathematical concepts review
 - Review basic fractions, decimals and rounding of numbers
- Ohm's law
 - Determine power, current, voltage and resistance using Ohm's Law
- Articles 210 through 310
 - Examine each article and find important information on proper number of circuits, box conductors and for proper size of services
- Article 430
 - Identify the difference between nameplate and NEC tables and how to use the NEC tables to make critical calculations

Course length: 1 day

CEU credits: 0.8

Fee: \$249



National Electrical Code (NEC) - Grounding and Bonding

The Economic and Workforce Development Division certifies that the participant meets the requirements to receive Professional Development Units (PDU's) in compliance with the Continuing Competency Program outlined by the State Electrical Board of Division Registrations of the Colorado Department of Regulatory Agencies. The PDU's are considered applicable to consumer protection and meet the core competencies of the designated topic as identified by the State Electrical Board.

Objective

Explore the Grounding and Bonding sections of the 2011 National Electrical Code and demonstrate various electrical calculations.

Who Should Attend

Electricians that want to earn Professional Development Units (PDU's) toward renewing their State of Colorado Electrician's License.

Course Content

Examine Article 230 and Article 250 of the 2011 NEC. Determine different load calculations and size conductors for grounding and bonding at services and at the load.

- Article 230
 - General information
 - Overhead service conductors
 - Underground service conductors
 - Services for over 600V, nominal
- Article 250
 - General requirements
 - System grounding
 - Enclosure, raceway bonding
 - Grounding electrode system and grounding electrical conductors
 - Methods of equipment grounding

Course length: 1 day

CEU credits: 0.8

Fee: \$249



National Electrical Code (NEC) - Introduction

This course is designed as an introduction to understanding and applying the National Electrical Code (NEC). Participants will study the hierarchy of regulatory agencies that govern, co-exist and supplement the requirements of the NEC; as well as become familiar with specific sections of the manual that regulate wiring, circuit protection and motor protection and control.

Objective

The objective of this course is to provide an introduction to the requirements of the NEC and how these requirements apply to electricians, electrical maintenance and other industrial electrical workers in the performance of their jobs.

Who Should Attend

This course is designed to benefit individuals who have little or no working experience with using the NEC or use of the NEC manual.

Course Content

- NEC definitions and terminology
- Conductor ampacities and wire sizes and standard color
- Properly size and specify overcurrent protections
- Requirements for grounding & bonding
- Sizing and installing branch circuits
- Types of electrical enclosures
- Types of flexible cords and their uses
- Sizing motor and motor controller circuits, motor disconnects, motor short circuit protection and motor overload protection
- Cable sizes to use, the number of conductors and the de-rating of cabling under certain conditions.
- Types of Raceways (including conduit), when to use them and the installation requirements

Course length: 3 days

CEU credits: 2.4

Fee: \$599



National Electrical Code (NEC) - Wiring Methods

The Economic and Workforce Development Division certifies that the participant meets the requirements to receive Professional Development Units (PDU's) in compliance with the Continuing Competency Program outlined by the State Electrical Board of Division Registrations of the Colorado Department of Regulatory Agencies. The PDU's are considered applicable to consumer protection and meet the core competencies of the designated topic as identified by the State Electrical Board.

Objective

Investigate the different wiring methods identified in the 2011 National Electrical Code and demonstrate use of wiring tables listed in NEC text.

Who Should Attend

Electricians that want to earn Professional Development Units (PDU's) toward renewing their State of Colorado Electrician's License.

Course Content

Examine the Articles 300 through 392 in the 2011 NC including all conduits, wire ways, cables and Romex.

- Conduit fill
- Conduit ampacity
- Wire ampacity
- Chapter 9 Tables 1-11A
- Annex C Tables
- Requirements of 600V and above

Course length: 1 day

CEU credits: 0.8

Fee: \$249



Programmable Logic Controllers (PLC's) - Advanced

This course is designed to provide the fastest and most effective procedure for isolating and correcting problems with Allen-Bradley and Siemens PLC systems using RSLogix, RSLinx and Direct Soft software. This course builds upon the introduction level course but that course is not required as long as participants have a basic understanding of PLC systems. This course is taught in a hands-on environment. Even though the course utilizes Allen-Bradley products, this course covers topics that are universal to the use of PLC's in the field.

Objective

The objective of this course is to provide workers experienced with Programmable Logic Controllers (PLC's) with a more in-depth understanding of the troubleshooting and programming of these systems. This course also provides an introduction to monitoring PLC's for faults and current status, including Ethernet, PanelView HMI, Producer and Consumer tags that control the system.

Who Should Attend

This course is designed to benefit individuals who have a basic background in or experience with programmable logic controller systems. It is also recommended for those interested in programmable logic controller systems.

Course Content

- Industrial prints to identify field to PLC connectivity
- Using RSLinx software to Monitor Data and perform DDE/OPC data transfers
- Identify and clear major and minor faults using RSLogix5000 and LC front panel lights
- Electrical noise & grounding
- Wire and program clamp and drill and garage door interface
- Ethernet networking and fiber optic Ethernet
- Setting and retrieving status bits
- Producer/Consumer tags
- Distributed IO (over Ethernet)
- Using RSLogix5000 to make on-line edits
- Using RSLogix5000 to force input and output, and create trends to monitor a project
- Wire and program a PLC ladder logic PID controller
- Program a PanelView HMI interface using FactoryTalk View Studio
- Analog inputs and outputs (4-20mA & +/- 10V)

Course length: 3 days

CEU credits: 2.4

Fee: \$599



Programmable Logic Controllers (PLC's) - Introductory/Intermediate

This course is designed as an introduction to programmable logic controller systems. Participants learn what programmable logic controller systems are, how they work, and how they can be used to control various processes and machines. This course is taught in a hands-on environment, featuring the Allen-Bradley ControlLogix and MicroLogix, SLC systems and Siemens Direct Soft software. The course covers topics that are universal to the use of PLC's in the field.

Objective

The objective of this course is to provide an introduction of programmable logic controllers to the person who has little or no experience with these control systems. Participants will gain an understanding of the capabilities for controlling processes, equipment, and other functions in an industrial setting.

Who Should Attend

This course is designed to benefit individuals who have little or no working experience with programmable logic controller systems. It is also recommended for those interested in following up with the intermediate or advanced level courses.

Course Content

- Main components of the PLC systems and their functions
- Navigating through the RSLogix5000 and RSLinx software
- Setting up communications between the PLC and the PC
- Numbering systems
- Setting Ethernet IP network – assigning addresses to PLC's, PC's and PanelViews
- I/O systems, tags, and addressing
- Downloading and uploading programs
- Ladder logic programming basics
- Timing Sequencing using programming timers and programming counters
- Doing math, move, conversion instructions
- Event sequencing using limit switches and proximity switches
- Automating, stopping, stepping techniques used in ladder programming
- Transferring, monitoring, and running projects using RSLogix software
- Trending an operating PLC program.
- Numerous hands-on experiments to gain understanding and experience in all the above topics

Course length: 3 days

CEU credits: 2.4

Fee: \$599



Sensors and Transducers

This course is an introduction to sensor technology used in robotics, automated manufacturing and process control. It is important because sensing and measurement are a critical and failure prone part of all automated systems. This course is designed to be an introduction to and basics of instrumentation and industrial automated process controls. Hands-on activities are emphasized in the testing and integration of sensors in simple control systems and to provide understanding of data transmission and controller terminology.

Objective

This course is designed to provide participants with a solid understanding of the operation of process control sensors and transducers and to measure temperature, pressure, level and flow. Participants will learn automated process control and using and tuning PID controllers using sensors and transducers. Students will be competent in understanding the construction and troubleshooting of closed and open loop control systems.

Who Should Attend

The course is for technicians and managers desiring an introduction to instrumentation sensors and transducers, and closed loop control systems. Prior knowledge of PLC's, automated process and manufacturing environments is recommended but not required.

Course Content

- Understanding of Piping and Instrumentation Diagrams (P&ID), symbols of and reading P&ID drawings
- Temperature measurement theory and temperature measurement devices
- Pressure measurement theory and pressure measurement devices
- Flow measurement theory and flow measurement devices
- Level measurement theory and level measurement devices
- Hands on lab experiments: setting up a water pump to fill a water column and measure level using both pressure and an ultrasonic sensor, measuring and understanding orifice plate and venture flow elements and calibrating thermocouple and RTD temperature transmitters
- Open/closed loop control
- PID controller understanding and terminology
- PID tuning techniques
- 4-20 mA transmission loops
- HART communicator basics

Course length: 4 days

CEU credits: 3.2

Fee: \$799



Test Equipment

This course is designed to provide skills in understanding the proper use of test equipment for various industrial applications. Focus includes identifying the various types of test equipment, their strengths, limitations, reading and calibration.

Objective

This course will provide participants with the skills to:

- Gain a more in-depth understanding of test equipment
- Develop troubleshooting skills by utilizing the appropriate test equipment
- Gain a familiarity of use by hands-on exercises
- Understanding calibration

Course Content

- Proper selection of test equipment
- Symbols review & schematics
- Accuracy, resolution and calibration
- Digital multi-meters
- Current meters
- Hand held oscilloscopes
- Temperature measurement and recording devices
- Data loggers and chart recorders
- Capacitor testers
- Megohmmeter/hi-pot meters
- Ground and power test meters

Course length: 2 days

CEU credits: 1.6

Fee: \$439



Who Should Attend

This course is designed to benefit maintenance technicians, systems technicians, engineers, supervisors in maintenance or any staff involved with the support of testing various industrial systems.

Understanding Motor Circuitry and Motor Controls

This course is designed to provide advanced background information to facilitate isolating and correction problems with Industrial Motor Controls. This course expands training on motor speed feedback devices, soft starters and soft start techniques, NEC wiring and motor protection requirements, braking techniques, and Variable Frequency Drives (VFD's). This course builds upon the introduction level course but that course is not required as long as participants have a basic understanding of industrial motors and controls.

Objective

The objective of this course is to provide a somewhat experienced industrial electrical worker with a more in-depth understanding of the troubleshooting and maintenance of industrial motor control systems.

Who Should Attend

This course is designed to benefit individuals who have a background in or experience with motor controls. It is also recommended for those interested in motor controls.

Course Content

- NEC motor circuit wiring and motor protection requirements
- Resolvers, encoders, and tachometers.
- Reduced voltage starting and soft starters
- DC braking, ramp, dynamic and regen braking.
- Controlling and changing motor speed
- Variable Frequency Drives (VFD's)
- Hands-on exercises with VFD's and 3-phase motor control wiring and troubleshooting

Course length: 2 1/2 days

CEU credits: 2.0

Fee: \$499

