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Electrical

☐ **AC/DC Electrical Systems**

990-ACDC1

AC/DC Electrical course teaches fundamentals of AC/DC electrical systems used for power and control in industrial, commercial, agricultural, and residential applications. Students learn industry-relevant skills included in subject areas such as Basic Electrical Circuits, Electrical measurement, Circuit Analysis, Inductance and Capacitance, Combination Circuits, and Transformers.

- Basic Electrical Circuits
- Electrical Measurements
- Circuit Analysis
- Inductance and Capacitance
- Combination Circuits
- Transformers

☐ **Electric Relay Control**

990-EC1

Introduces the functions of relay logic control circuits used in industrial, commercial and residential applications. Describing functions and application of functions covered in control logic include logic elements such as AND, OR, NOT, NOR, and NAND. Ladder Diagrams are explained and learners connect, operate, and design a ladder diagram using one or more logic elements. Additional concepts include Electro-pneumatic solenoid valves; sequencing control including relay operation, relay application, limit switch operation and application; and timers and advanced systems including time-delay relays, multiple cylinder control, and machine modes of operation.

- Control Logic
- Sequencing Control
- Timers and Advanced Systems

☐ **Electric Relay Control Troubleshooting**

990-EC1F

This course covers electrical relay control troubleshooting techniques and aids. Major topics include: making electrical measurements with a digital multimeter; reading and interpreting a troubleshooting chart; troubleshooting a control circuit failure; and more!

- Introduction to Troubleshooting

☐ **Electronic Sensors**

990-SN1

Electronic Sensors teaches the operation of non-contact sensors and their applications in industry, such as sensing movement, detecting metal versus non-metal, and determining speed. This course covers sensors such as inductive, capacitive, magnetic reed, hall-effect, and photoelectric.

- Introduction to Electronic Sensors
- Electronic Sensor Applications

☐ **Electric Motor Control**

990-MC1

Electric motor control teaches electric relay control of AC electric motors found in industrial, commercial, and residential applications. Learners gain understanding of the operation, installation, design, and troubleshooting of AC electric motor control circuits for many common applications. Develops skills in interpreting schematics, system design, motor start / stop circuits, motor sequence control, reversing motor control, and motor jogging. Safety is emphasized throughout, highlighting motor safety, lockout/ tagout and safety interlocks.

- Introduction to Electric Motor Control
- Manual Motor Control and Overload Protection
- Control Transformers
- Control Ladder Logic
- Control Relays and Motor Starters
- Reversing Motor Control
- Automatic Input Devices 1
- Basic Timer Control: On-Delay and Off-Delay

☐ **Electric Motor Control Troubleshooting**

990-MC1F

Portable Electric Motor Control Troubleshooting covers valuable topics that allow learners to fully understand how to troubleshoot electric motors. Topics include voltage testing equipment, control component troubleshooting, motor starter troubleshooting, power component troubleshooting, troubleshooting methods, systems troubleshooting, and troubleshooting motor control circuits.

- Introduction to Troubleshooting
- Systems Troubleshooting

Mechanical

☐ **Mechanical Drives 1**

990-ME1M

This course provides a comprehensive understanding of how to operate, install, and analyze mechanical drives and how they are used in real-world applications. Learners will study topics like: the function and construction of a bedplate; four types of shaft material; the operation of a fractional HP V-belt drive; how to determine allowable chain sag for a given application; and methods of measuring spur gear backlash.

- Introduction to Mechanical Drive Systems
- Key Fasteners
- Power Transmission Systems
- Introduction to V-Belt Drives
- Introduction to Chain Drives
- Spur Gear Drives
- Multiple Shaft Drives

☐ **Mechanical Drives 2**

99-ME2M

Within the Portable Mechanical Drives training course, learners will study in-depth topics like: methods of identifying belt size and type; how to select sheaves, bushings, and a V-belt for given applications; how to install and align a timing belt drive system; how high torque drive belts and sprockets are specified; and maintenance steps for synchronous belt drives.

- Heavy Duty V-Belt Drives
- V-Belt Selection and Maintenance
- Synchronous Belt Drives
- Lubrication Concepts
- Precision Shaft Alignment
- Couplings
- Heavy-Duty Chain Drives

☐ **Laser Shaft Alignment**

99-ME2AM

Laser Shaft Alignment is rapidly gaining popularity in industry because it enables maintenance and plant engineering personnel to make quicker and more accurate shaft alignments than other shaft alignment methods. Laser shaft alignment systems avoid problems such as sagging indicators, reading resolution error, and reading parallax error.

- Introduction to Laser Shaft Alignment
- Laser Shaft Alignment Operation

Fluid Power

☐ **Hydraulics**

990-BH1

This course covers topics like basic hydraulic circuits, pressure control circuits, hydraulic schematics, and sequence valves. Learners will study how to operate a 4-way, 3-position directional control valve, the basic rules of drawing hydraulic schematics, the function of the flow control valve, and more.

- Hydraulic Power Systems
- Basic Hydraulic Circuits
- Principles of Hydraulic Pressure and Flow
- Hydraulic Speed Control
- Pressure Control Circuits

☐ **Pneumatics**

990-PN1

This course begins by covering the basics of pneumatics and pneumatic circuits. Learners then advance to the principles of process and flow, air logic, and pneumatic maintenance. Pneumatic speed control circuits and pneumatic directional control valve applications are also covered.

- Pneumatic Power Systems
- Basic Pneumatic Circuits
- Principles of Pneumatic Pressure and Flow
- Pneumatic Speed Control Circuits
- Pneumatic DCV Applications
- Air Logic
- Pneumatic Maintenance

☐ **Pneumatics Troubleshooting**

990-PTB1

This course will cover major topics like troubleshooting air preparation, actuators, valves, vacuum systems, and pneumatic systems. Specifically, learners will study objectives such as: pressure test points; symptoms and causes of regulator failure; the operation of an internal pilot-operated directional control valve; inspection and troubleshooting a vacuum cup; and troubleshooting zero pressure.

- Introduction to Pneumatic Troubleshooting
- Air Preparation Troubleshooting
- Troubleshooting Actuators and Valves
- Troubleshooting Vacuum Systems
- Troubleshooting Pneumatic Systems

Programmable Logic Controllers

☐ **PLC - Allen-Bradley CompactLogix L16**

990-PAB53A

Portable PLC covers PLC (Programmable Logic Controller) programming, operation, and applications used in industry. This course covers a wide variety of program commands, ranging from timers and contacts, stepper motor control, and PWM control that will quickly develop relevant and critical skills to be job ready in modern industry environments.

- Introduction to Programmable Controllers
- Basic PanelView Plus Terminal Operation
- PLC Program Operations
- PLC Programming
- PLC Motor Control
- PLC Timer and Counter Instructions
- Event Sequencing
- Program Control Instructions
- Math and Data Move Instructions
- PanelView Plus Application Editing
- PanelView Plus Application Editing 2
- Analog Inputs
- Analog Outputs
- Variable Output Applications

☐ **PLC Troubleshooting - Allen-Bradley CompactLogix L16**

990-PAB53AF

Portable PLC Troubleshooting covers PLC (Programmable Logic Controller) programming, operation, and applications used in industry, as well as PLC troubleshooting skills, such as PLC input and output testing, software testing, and application troubleshooting. This course covers a wide variety of program commands, ranging from timers and contacts, stepper motor control, and PWM control that will quickly develop relevant and critical skills to be job ready in modern industry environments.

- Introduction to PLC Troubleshooting
- PLC Systems Troubleshooting
- Analog Input/Output Troubleshooting
- Analog Application Troubleshooting

□ **PLC - Siemens S7-1200**

990-PS712

Today's workforce needs skills in programming, operation and troubleshooting of modern PLC systems that use HMI panels, networking, and a variety of basic and advanced program commands. This course addresses this need by providing a comprehensive curriculum and application workstation that teaches modern PLC systems as they are used in industry today. Students learn both basic and advanced applications using the powerful Siemens S7-1200 PLC and use KTP600 HMI panels and networks throughout the curriculum.

- Introduction to Programmable Controllers
- Basic HMI Panel Operation
- PLC Program Operations
- PLC Programming
- PLC Motor Control
- PLC Timer and Counter Instructions
- Event Sequencing
- Program Control Instructions
- Math and Data Move Instructions
- HMI Application Editing
- HMI Application Editing 2
- Analog Inputs
- Analog Outputs
- PLC Motion Control

□ **PLC Troubleshooting - Siemens S7-1200**

990-PS712F

PLC Troubleshooting course – Siemens S7-1200 provides a mobile option for teaching both basic and advanced applications as well as sophisticated troubleshooting using the powerful Siemens S7-1200 PLC. Programming, operating, and troubleshooting skills on modern PLC systems are vital for future professionals. The course integrates an HMI panel, networking, and a variety of programming commands in order to teach real-world processes.

- Introduction to PLC Troubleshooting
- PLC Systems Troubleshooting
- Analog Input/Output Troubleshooting
- Analog Application Troubleshooting

Variable Frequency Drives

☐ **Variable Frequency AC Drive**

990-DRV1

Portable AC Motor Drive teaches variable frequency AC solid-state control of 3-phase electric motors. Learners develop knowledge in the operation, installation, performance analysis, troubleshooting, and design of AC solid state control using 2-wire, 3-wire, manual, and open-loop speed control. Highlights motor jogging and dynamic braking as well as programmable acceleration and deceleration.

- Variable Speed AC Drive Basics
- Jogging, Two-Wire, and Three-Wire Control
- Basic Speed Control
- Advanced Speed Control
- VFD Ramping Functions
- Speed and Torque Control
- VFD Acceleration and Braking

☐ **Variable Frequency AC Drive Troubleshooting**

990-DRV1F

Portable AC Motor Drive Troubleshooting covers valuable troubleshooting skills for AC motor drives. Learners will study common problems that arise with AC motor drives and how to troubleshoot them. Major topics include fault detection, troubleshooting, and clearing faults.

- Fault Diagnostics and Troubleshooting

Electronics

□ Power and Control Electronics

990-ELE1

This course covers how to operate, adjust, and troubleshoot electronic components, circuits, and systems used in machine applications. This course's major topics include: oscilloscopes; linear power supply; power supply filtration and regulation; solid state relays; discrete sensing devices; thermal sensing devices; amplifiers and op amps; analog sensing devices; solid state switching; and solid state speed and power control.

- Oscilloscopes
- Waveform Measurements
- Oscilloscope Probes
- Power Supplies
- Diodes
- Half-Wave and Full-Wave Rectifiers
- Current Limiters and Capacitive/Inductive Filters
- Combination Filters and Regulation
- Bipolar Junction Transistor (BJT)
- Solid State Relays and Machine Interfacing
- Inductive and Capacitive Proximity Sensors
- Photoelectric and Hall Effect Sensors
- Thermistors
- Thermocouples
- Resistance Temperature Detector
- Transistor Amplifiers
- Open-Loop Operational Amplifiers
- Closed-Loop Operational Amplifiers
- Pressure Sensors
- Ultrasonic Sensors
- Switching Transistor
- FET Speed Control Circuits and Switching Power Supplies
- Silicon-Controlled Rectifiers (SCRs) and Phase Control
- Triacs
- Triac Phase Control Circuits

Quality Assurance

☐ **Measurement Tools**

990-MES1

This course introduces the fundamental principles of measurement including basic measurement, precision measurement, direct gauging, indirect gauging, and dimensional measurements using both the U.S. customary system as well as S.I. metric system. Major topic areas include tape measurement, measurement conversion, precision measurement tools, dial caliper, digital caliper, micrometers, dimensional gauging, indicator measurement, and data collection.

- Basic Measurement
- Precision Measurement Tools
- Dimensional Gauging

☐ **Precision Gauging 1**

990-PG1

Measurement is a cornerstone of all technical career paths and a major part of quality assurance. This course covers basic measurement, precision measurement, direct gauging, indirect gauging, and dimensional measurements using both the U.S. customary system and the SI metric system.

- Basic Measurement
- Precision Measurement
- Dimensional Gauging

Process Control

☐ **Level/Flow Process Control Troubleshooting**

990-PC1F

This course covers level and flow process control topics like valve and sensor-level troubleshooting, flow transmitter hardware and software troubleshooting, controller hardware and software troubleshooting, and more! Learners will study symptoms of I/P converter faults and their causes, how to troubleshoot no flow faults in an on/off level control system, and how to troubleshoot the setpoint not being maintained in a closed loop level control system.

- Pressure-Type Level Sensor Troubleshooting
- Paddlewheel Flow Sensor Troubleshooting
- Flow Transmitter Hardware Troubleshooting
- Flow Transmitter Software Troubleshooting
- I/P Converter Troubleshooting
- Diaphragm-Actuator Valve Troubleshooting
- Controller Hardware Troubleshooting
- Controller Software Troubleshooting
- On/Off Control System Troubleshooting
- Closed Loop Control System Troubleshooting

Smart Sensors

☐ **Smart Machine Sensors**

990-SD10

This course covers cloud computing, smart sensor configuration and monitoring, smart photoelectric sensors, smart condition monitoring, and smart RFID readers. Learners will study in-depth topics like manufacturing applications of Industrial Internet of Things (IIoT), edge and fog computing, and the function of an IO-Link Master, as well as how to configure and test the following: smart sensors using an IO-Link Bluetooth application, multi-function smart sensors, and a smart RFID reader using IO-Link software.

- Industrial Internet of Things
- Cloud Computing
- Smart Photoelectric Sensor Configuration
- Smart Sensor Configuration and Monitoring
- Smart Condition Monitoring Sensors
- Smart RFID Readers

☐ **Smart Process Sensors**

990-SD20

This course covers smart pressure sensors and smart level and flow sensors used in instrumentation processes. Users will study topics such as: components used in Industrial Internet of Things applications; cloud computing and its benefits; edge and fog computing; how to configure an IO-Link Master; the function of smart sensors; the operation of a smart analog pressure sensor; and testing a smart point level sensor.

- Industrial Internet of Things
- Cloud Computing
- Smart Pressure Sensors
- Smart Flow and Level Sensors