RedVector
BY VECTOR SOLUTIONS

INSTRUMENTATION AND CONTROL CURRICULUM

OVERVIEW: Technological advancements in process monitoring, control and industrial automation have contributed greatly to improving the productivity of manufacturing operations across the globe. The interpretation of timely and accurate measurements is a critical consideration in any processing plant. In the context of process control, all controller decisions are similarly based on measurement data.

COURSES: RedVector offers skills-based online interactive training to help companies better train operations, instrumentation and control personnel.

This training is designed to improve knowledge and skills by providing an understanding of process variables, direct-read instruments, elements of control systems, sensors, transmitters, recorders, controllers, final control elements, basic control loops, continuous process and PLCs. Benefits of the training program and online methodology include:

- Consistent delivery, with broader reach, flexible scheduling and automated recordkeeping
- Increased subject mastery and retention, with reduced learning time
- Enhanced productivity

AUDIENCE:

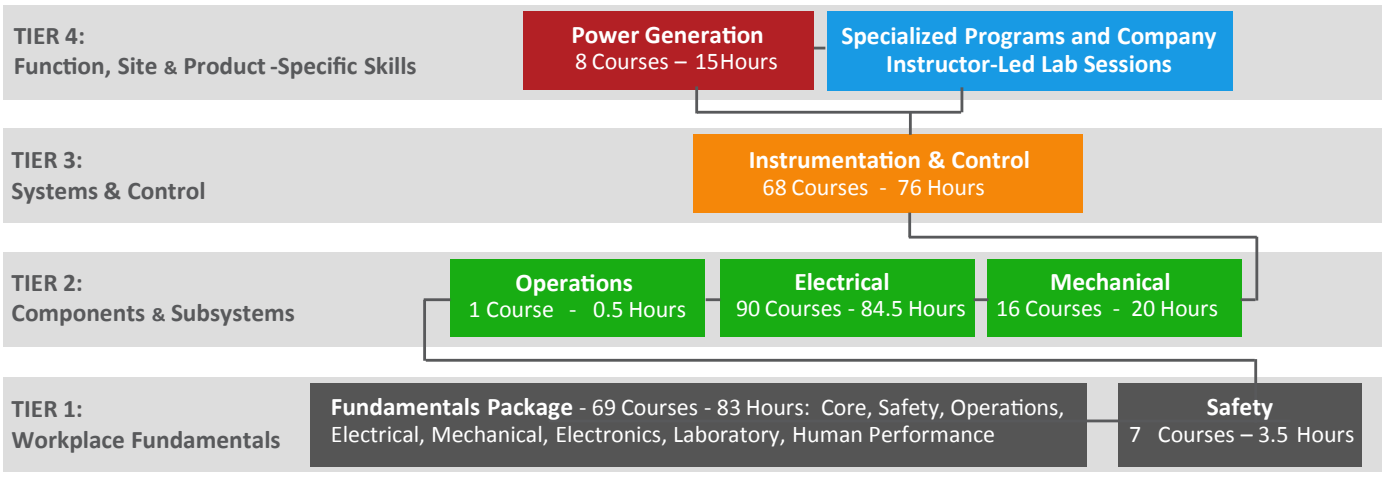
- Plant Operators and Managers
- Technicians Responsible for Data Systems, Process Variables & Drives Management
- Automated Instrument Mechanics and Automated Manufacturing Coordinators

eLEARNING: RedVector's online approach and easily integrated solutions help save money, improve performance and reach more people. Engaging, interactive modules, with real-world video, animated graphics, pop-up descriptions, demonstrations and simulations, are designed to put the student "on location" in real situational examples.

The flexible delivery model for design, delivery, testing, tracking, reporting and communication works with any learning management system (LMS), or through the RedVector LMS. With either delivery option, it is easy to:

- Install/remove course units, enroll/delete trainees and import/export trainee records
- Establish performance requirements and set pre and post-test passing scores
- Customize curriculum with site-specific content, company-developed learning modules and/or custom test creation
- Generate a variety of reports

INSTRUMENTATION AND CONTROL LEARNING PLAN



FUNDAMENTALS

- Industrial Math: Basic Operations, Part 1
- Industrial Math: Basic Operations, Part 2
- Math: Basics
- Industrial Math: Algebra
- Industrial Math: Formulas, Graphs, and Trends
- Hand Tools, Part 1
- Hand Tools, Part 2
- Precision Measurement Tools, Part 1
- Precision Measurement Tools, Part 2
- Forklifts: Operation
- Safety Orientation
- Back Safety
- Fall Protection
- Hearing Conservation
- Bloodborne Pathogens
- Personal Protective Equipment
- Fire Safety
- Classes of Fires and Extinguishers
- Warning Signs and Labels
- Respiratory Protection
- Safety Data Sheets
- Safety: Chemical Health Hazards
- Electrical Safety
- Diagrams: Blueprints
- Operator Responsibilities: Introduction
- Operation - Basic Principles
- Operator Responsibilities: Advanced Operator Responsibilities
- Statistical Process Control: Basic Control Charts
- Troubleshooting: Basic Concepts
- Plant Science: Basic Electrical Principles
- Plant Science: Basic Electrical Circuits
- Electrical Maintenance: Battery Systems
- Fans
- Plant Science: Basic Principles
- Plant Science: Fluid Systems
- Plant Science: Forces and Machines
- Plant Science: Gases and Flowing Liquids
- Plant Science: Solids and Liquids
- Bearing Basics
- Equipment Lubrication: Lubricants and Bearing
- Hydraulics: Routine Maintenance
- Pumps: Basic Types and Operations
- Efficient Pump Operation
- Valves: Electric and Hydraulic Actuators
- Welding: Oxy-Fuel Gas Welding
- Welding: Arc Welding
- Refrigeration System: Operation
- Plant Science: Heat
- Plant Science: Heat Transfer
- Heat Exchangers: Introduction
- SCRs and TRIACs
- Quality Control and Assurance
- Procedure Use and Adherence
- Stop When Unsure
- Decision Making
- Managing Yourself
- “Are You Ready?” Checklist
- Self-Checking (STAR)
- Problem Solving
- Peer Checking
- Co-Worker Coaching
- Managing a Work Group
- The Team Advantage
- Clear Communication
- 3-Way Communication
- Interpersonal Communication
- Turnover
- Discipline

SAFETY

- Respirator Fit Testing
- Workplace Ergonomics
- Laboratory Safety
- Driving Safety
- Hazard Communication
- HazWoper: Introduction
- HazWoper: First Responder - Awareness Level

OPERATIONS

- Basic Electrical Safety

ELECTRICAL

- Construction of AC and DC Circuits
- Maintenance of Air and Oil Circuit Breakers
- Electrical 1: Electrical Safety
- Maintenance of Low-Voltage Circuit Breakers
- Safety: Electrical
- Sources of Electricity
- Electrical Equipment: Electrical Production and Distribution
- Electrical 1: Electrical Diagrams
- Reading Electrical Diagrams, Part 1
- Electrical 2: Electrical Lighting
- Basic Control Circuits
- Industrial Switches
- Batteries
- Voltage and Current Principles
- Magnets and Magnetic Fields
- Transformers
- Capacitors, Part 1
- Capacitors, Part 2
- Resistance
- Inductors, Part 1
- Inductors, Part 2
- Alternating Current
- Alternating and Direct Current
- Parallel Circuits
- Series Circuits
- Series-Parallel Circuits
- Ohm’s Law
- Kirchhoff’s Law
- Use of Ohm’s and Kirchhoff’s Laws in DC Circuits
- Using Electrical Test Equipment
- Electromagnetic Relays
- Contactors and Relays
- Electrical 2: Motors: Theory and Application
- DC Motor Basics
- Electrical Equipment: AC and DC Motors
- Electrical Equipment: Transformers, Breakers, and Switches
- Electrical Wiring: Cables and Conductors
- Electrical Wiring: Conduit Installation
- Electrical Maintenance: Fasteners
- Raceways
- Electrical 1: Cable Tray
- Electrical 1: Conductors
- Conductors
- Electrical 2: Boxes and Fittings
- Electrical 1: Commercial and Industrial Wiring
- Electrical 2: Installation of Electrical Services
- Electrical Wiring: Splices and Terminations
- Electrical 2: Grounding
- Grounding
- Fuses
- Ground Fault Circuit Interrupters
- Circuit Breakers
- Circuit Breakers: Breakers and Switchgear, Part 2
- Electrical 2: Circuit Breakers and Fuses
- Electrical Systems and Equipment, Part 1
- Electrical Systems and Equipment, Part 2
- Troubleshooting Systems and Circuits
- Electrical Maintenance: Troubleshooting Electrical Circuits
- DC Motor Maintenance
- Electrical Equipment: Motor Controllers and Operation
- DC Motor Controller Maintenance, Part 1
- DC Motor Controller Maintenance, Part 2
- AC Motor Controller Maintenance, Part 1
- AC Motor Controller Maintenance, Part 2
- Synchronous Motor and Controller Maintenance
- Transformer Maintenance
- AC Generator Maintenance
- Single-Phase AC Induction Motor Maintenance
- Three-Phase AC Induction Motor Maintenance
- Reading Electrical Diagrams, Part 2
- AC Generator Basics
- DC Generator Basics
- Basic Electricity Review
- DC Fundamentals Review
- AC Fundamentals Review
- Introduction to Basic Diagrams and Symbols, Part 1
- Introduction to Basic Diagrams and Symbols, Part 2
- Reading and Understanding Schematics
- Measuring Current, Voltage, and Resistance
- Electrical Maintenance: Introduction to the NEC
- Variable Speed Drives: Introduction to VSDs
- Variable Speed Drives: Common Applications
- Variable Speed Drives: Installation
- Variable Speed Drives: Programming AC Controllers
- Variable Speed Drives: Programming DC Controllers
- Variable Speed Drives: Controllers and Troubleshooting, Part 1
- Variable Speed Drives: Controllers and Troubleshooting, Part 2
- Variable Speed Drives: Systems and Integration
- Variable Speed Drives: System Troubleshooting, Part 1
- Variable Speed Drives: System Troubleshooting, Part 2

MECHANICAL

- Sliding Surface Bearings, Part 2
- Rolling Contact Bearings, Part 1
- Rolling Contact Bearings, Part 2
- Couplings
- Equipment Drive Components: Couplings
- Equipment Drive Components: Gear, Belt, and Chain Drives
- Basic Lubrication
- Lubrication: Basics
- Equipment Lubrication: Using Lubricants
- Safety: Basics
- Vibration Analysis: Introduction
- Gears: Types and Characteristics
- Safety Valves, Part 1
- Safety Valves, Part 2
- Valves: Introduction to Actuators
- Heat Exchangers: Condensers and Reboilers

INSTRUMENTATION & CONTROL: 68 Courses, 76 Hrs

- Core: Principles of Calibration
- Temperature and Temperature Measurement, Part 1
- Temperature and Temperature Measurement, Part 2
- Pressure Gauges and Calibration, Part 1
- Pressure Gauges and Calibration, Part 2
- Pressure and Pressure Measurement
- Liquid Level Measurement, Part 1
- Liquid Level Measurement, Part 2
- Fluid Flow Measurement, Part 1
- Fluid Flow Measurement, Part 2
- Continuous Process: Principles
- Continuous Process: Field Devices: Using Field Communicators
- Continuous Process: Field Devices: Pressure, Temperature, and Weight
- Continuous Process: Field Devices: Level and Flow
- Continuous Process: Pneumatic Controls
- Continuous Process: Field Devices: Analog Configuration
- Continuous Process: Field Devices: Digital Configuration with a DCS
- Continuous Process: Field Devices: Configuring with a Laptop PC
- Continuous Process: Field Devices: Analytical
- Continuous Process: Single Loop Control
- Continuous Process: Multiple Loop Control
- Continuous Process: Tuning Loops
- Continuous Process: Troubleshooting Loops
- Continuous Process: Troubleshooting DCS I/Os: Procedures
- Continuous Process: Smart Controllers
- ControlLogix®: Basic Programming
- ControlLogix®: Communications and Advanced Programming
- ControlLogix®: Configuring Hardware and Software
- ControlLogix®: Introduction to Basic System, Software & Hardware Components
- ControlLogix®: The Project Structure
- ControlLogix®: Troubleshooting
- DCS Introduction
- Instrumentation and Control: The Human-Machine Interface
- Instrumentation and Control: Introduction to Process Control
- Instrumentation and Control: Introduction to Control and Data Systems
- Instrumentation and Control: Measurement of Pressure and Temperature
- Instrumentation and Control: Measurement of Level and Flow
- Instrumentation and Control: Automatic Process Control, Part 1
- Instrumentation and Control: Automatic Process Control, Part 2
- Instrumentation and Control: Measurement of Concentration
- Instrumentation and Control: Measurement of Density, Clarity, and Moisture
- PLCs: Architecture
- PLCs: Design and Installation of a PLC System
- PLCs: Installing and Maintaining
- PLCs: I/O Communication
- PLCs: Introduction and Theory of Operations
- PLCs: Introduction to Programming, Part 1
- PLCs: Introduction to Programming, Part 2
- PLCs: Ladder Logic and Symbology
- PLCs: Numerics, Part 1
- PLCs: Numerics, Part 2
- PLCs: Hardware, Inputs, Outputs, Discrete/Analog
- PLCs: Logic Operations
- PLCs: Program Entry, Testing, and Modification, Part 1
- PLCs: Program Entry, Testing, and Modification, Part 2
- PLCs: Programming a PLC System
- PLCs: Programming Functions, Part 1
- PLCs: Programming Functions, Part 2
- PLCs: Networks and Network Troubleshooting
- PLCs: Troubleshooting Software, Part 1
- PLCs: Troubleshooting Software, Part 2
- PLCs: Troubleshooting Hardware
- PLCs: HMIs and Troubleshooting
- Networks Introduction
- Networks: Setting Up and Troubleshooting
- Networks: Fiber Optic Systems
- Diagrams: Industrial Process Systems

POWER GENERATION: 8 Courses, 15 Hours

- Power Plant Systems: Power and Energy
- Boiler Instruments and Control
- Furnaces: Furnace Introduction
- Furnaces: Startup and Shutdown
- Furnaces: Operating Conditions
- Power Plant Protection: Integrated Systems
- Water Treatment: Wastewater, Part 1
- Water Ttment: Wastewater, Part 2