VINCENNES
UNIVERSITY
BUSINESS & INDUSTRY TRAINING

Industrial Maintenance and Robotics
2018 COURSE DESCRIPTIONS

**Vincennes University ABB Robotics Lab and
Industrial Maintenance Training Center**

For schedules and locations of Industrial Maintenance and ABB Robotics training, please visit our website(s).

Website: *http://www.vinu.edu/web/guest/industrial-maintenance*

and

Website: *www.abb.us/roboticstraining*

To enroll in Industrial Maintenance Classes, contact:

Martha Vance
Email: mvance@vinu.edu
Phone: 812-888-5284

For more information about Industrial Maintenance Classes, contact:

Jerry Ruble
Director, Industrial Maintenance and ABB Robotics Training
Indiana Center for Applied Technology (ICAT), Room 105
Vincennes University
Email: jruble@vinu.edu
phone: 812-888-4346
cell: 812-890-6702

Hubie Holland
Instructor, Industrial Maintenance Training
Email: hholland@vinu.edu
Phone: 812-888-4413

Brandon Mullen
Instructor, Industrial Maintenance Training (Lebanon, IN)
Email: bmullen@vinu.edu
Phone: 317-381-6072

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PLCs & Modules

ABB ROBOTICS TRAINING**

**Note: all ABB training is held at the Vincennes Campus

VUGC, Gibson Center for Advanced Manufacturing and Logistics, Fort Branch, Indiana

VU CTIM, Center for Technology, Innovation and Manufacturing, Jasper, Indiana

VU ICAT, Indiana Center for Applied Technology, Vincennes, Indiana

Gene Haas Training and Education Center Lebanon, Indiana

E10 - BASIC AC/DC ELECTRICAL SYSTEMS

Description:

This course is designed for those who are seeking basic training in AC and DC electricity. We use the Amatrol model T7017 AC/DC Electrical Hands-On Learning System to teach the fundamentals of AC and DC electrical systems used for power and control in industrial, commercial, agricultural, and residential applications. Students learn industry-relevant skills including how to operate, install, design, and troubleshoot (using multimeters) basic AC and DC electrical circuits for various applications.

This course is designed not only for maintenance technicians but any other personnel working in industrial, commercial, agricultural and residential settings. This course is for anyone who needs to understand basic electricity in order to improve efficiencies and uptime at their location.

Curriculum:

1. **Basic Electrical Circuits**

   a. Fundamental Electricity
   b. Electrical Circuit Components
   c. Manual Input Devices
   d. Manual Output Devices

2. **Electrical Measurements**

   a. Voltage Measurement
   b. Intro to Series and Parallel Circuits
   c. Current Measurements
   d. Resistance Measurements

3. **Circuit Analysis**

   a. Power in Series Circuits
   b. Power in Parallel Circuits
   c. Circuit Protection Devices

4. **Inductance and Capacitance**

   a. Electromagnetism
   b. Inductance
   c. Capacitance
   d. Characteristics of Capacitance
   e. Inductor and Capacitor Applications

5. **Combination Circuits**

   a. Characteristics
   b. Lighting Circuits
   c. Voltage Dividers
   d. Troubleshooting

6. **Transformers**

   a. Introduction to Transformers
   b. Sizing a transformer
   c. Transformer Types

Textbooks/Workbooks:

6 Amatrol Learning Activity Packet Booklets

Summary:

This is an 8 hour per day, 3 day course.
No prior electrical knowledge is required.
Cost: $900 per student includes lunch and books/LAPs
Discounts are available for multiple students attending from the same company.
Call Martha Vance to enroll @ 812-888-5284 or call Jerry Ruble @ 812-888-4346 for more information.

This course is designed for anyone who needs to understand basic industrial electricity in order to improve safety and efficiencies at their manufacturing, commercial, or industrial plants or building facilities. Also, anyone wanting to further their knowledge in electric motor controls, PLC's or other machine electrical controls need this basic electrical training as a foundation for more complex topics. Attendees come from a wide variety of industries, skill-levels, company sizes, and job titles. People who will benefit from attending this seminar include…

All Maintenance and Engineering Personnel in:

- Manufacturing Plants
- Commercial Buildings
- Machine Shops
- Schools
- Government Buildings
- Shopping Centers
- Apartment Buildings
- Hospitals
- Waste Water Facilities

Including:

- Mechanics
- HVAC Technicians
- Machine Operators
- Apprentices
- Alarm Technicians
- Non-Electrical Engineers
- Building Maintenance or Engineers
- Multi-craft & Cross Training Personnel
- Any person needing a basic course in industrial electricity

E20 - ELECTRIC MOTOR CONTROL TRAINING

Description:

This course is designed for those who are seeking basic training in AC electric motor control. We use the Amatrol model 85-MT5 Electric Motor Control Learning System to teach electric relay control of AC electric 3 phase motors found in industrial, commercial, and residential applications. Students study industry-relevant skills including how to operate, install, design, and troubleshoot AC electric motor control circuits for various applications. Students also learn ladder diagram basics. One of the most popular sections in this training is system and component level troubleshooting. A must for any Industrial Maintenance Technician!

Students will explore the basic principles of electric motor control (both manual and magnetic), principles of ladder logic, standard control circuits such as start/stop and forward/reverse, as well as troubleshooting techniques. Topics include manual motor starters, control transformers, magnetic motor starters, overload protection, reversing techniques, timer relays, and automatic input devices. Advanced topics available include introduction to variable frequency AC drives. Attendees will learn through a combination of individualized, hands-on learning with motor control trainers and group instruction of concepts and principles.

Curriculum:

1. **Introduction to Electric Motor Control**

    a. Electrical Safety
    b. Three Phase Power
    c. Disconnects and Protective Devices
    d. Three Phase Motors

2. **Manual Motor Control and Overload Protection**

    a. Manual Motor Control
    b. Manual Motor Starter Operation
    c. Overload Protection

3. **Control Transformers**

    a. Introduction to Transformers
    b. Control Transformer Operation
    c. Control Transformer Applications in Machine Control

4. **Control Ladder Logic**

    a. Electrical Control System Basics
    b. Ladder Diagram Basics
    c. Logic Elements I
    d. Logic Elements II

5. **Control Relays and Motor Starters**

    a. Control Relays
    b. Magnetic Motor Starters
    c. Two-Wire Control
    d. Three-Wire Control

6. **Introduction to Troubleshooting**

    a. Introduction to Troubleshooting
    b. Control Component Troubleshooting
    c. Motor Starter Troubleshooting
    d. Power Component Troubleshooting

7. **Systems Troubleshooting**

   a. Test equipment for Troubleshooting
   b. Introduction to Systems Troubleshooting
   c. System Troubleshooting Methods
   d. Troubleshooting Application

8. **Reversing Motor Control**

   a. Manual Motor Reversing
   b. Reversing Magnetic Motor Starters
   c. Interlocking for Reversing Motor Control
   d. Modes of Operation
   e. H-O-A Control

9. **Automatic Input Devices I**

   a. Limit Switches
   b. Float Switches
   c. Pressure Switches
   d. Sequence Control

10. **Basic Timer Control: On-Delay and Off-Delay**

   a. On-Delay Timers
   b. Off-Delay Timers
   c. Troubleshooting

Additional Training Available: E21 - Variable Frequency AC Drives (using Allen-Bradley PowerFlex 4)
For other controllers, see E23 on page 12 and 13.

1. **Introduction to Variable Frequency AC Drives**

   a. Variable Speed AC Drive Basics
   b. Two and Three-Wire Motor Control
   c. Jogging Control

2. **VFD – Speed and Torque Control**

   a. Basic Speed Control
   b. Advance Speed Control
   c. Torque Control

3. **VFD – Acceleration, Deceleration, and Braking**

   a. Ramping
   b. Special Acceleration Methods
   c. Braking

4. **VFD – Fault Diagnostics and Troubleshooting**

   a. Fault Detection
   b. Troubleshooting
   c. Clearing Faults

Textbooks/Workbooks:
10 Amatrol Learning Activity Packet Booklets (+ 4 more if including the Variable Frequency AC Drives)

Summary:
The Electric Motor Control Training is an 8 hour per day, 5 day course.
Basic AC/DC Electrical knowledge is required.
Cost: $1,500 per student includes lunch and books/LAPs

*The Variable Frequency AC Drive Training is an 8 hour per day 2 day course.
Basic AC/DC Electrical knowledge and Motor Control Knowledge is required.
Cost: $600 for Variable Frequency AC Drives

Discounts are available for multiple students attending from the same company.
Call Martha Vance to enroll @ 812-888-5284 or call Jerry Ruble @ 812-888-4346 for more information.

E22 – ELECTRONIC SENSORS TRAINING

Description:

This course is designed for those who are seeking basic training in electronic sensors. We use the Amatrol model 85-SN1 Electronic Sensor Learning System to teach electronic sensors found in industrial and commercial applications. Students learn the operation of electronic, non-contact sensors (inductive proximity, capacitive proximity, Hall Effect, magnetic reed, photoelectric) and their applications in industry. Electronic sensors are used in many types of applications for feedback to electric relay controls and programmable controllers. Typical applications include sensing liquid levels through glass, metal from non-metal, color shape, and distance or proximity. Students learn industry-relevant skills, including how to operate, install, analyze performance, and design sensor systems.

This training provides the learner with the ability to set up and test each sensor's operation by presenting a variety of targets at various distances and angles. A target base and slide unit are capable of measuring the linear and lateral distance of the target from the various sensor faces as well as its angular offset to give the learner realistic exposure. The mounting position is adjustable by sliding the position of the sensor.
Each sensor's electrical leads are connected to plug-in jacks. Sensors are mounted on individual bases that quickly mount to the target presentation base and mount to other related learning systems for real world industrial applications. All outputs are 24VDC.

Curriculum:

1. **Introduction to Electronic Sensors**
   a. Introduction to Electronic Sensors
   b. Inductive Sensors
   c. Capacitive Sensors

2. **Electronic Sensor Applications**
   a. Magnetic Reed Sensors
   b. Hall Effect Sensors
   c. Photoelectric Sensors
   d. Sensor Applications

Textbooks/Workbooks:
2 Amatrol Learning Activity Packet Booklets

Summary:
The Electronic Sensor Training is an 8 hour per day, 1 day course.
No prerequisites are required.
Cost: $300 per student includes lunch and books/LAPs

Discounts are available for multiple students attending from the same company.
Call Martha Vance to enroll @ 812-888-5284 or call Jerry Ruble @ 812-888-4346 for more information.

E23 – AC ELECTRONIC DRIVES
(using Allen-Bradley PowerFlex 40, 70, ABB MicroFlex and Baldor H2)

Description:

This course is designed to teach industry-relevant skills of AC Electronic Drives including how to operate, install, tune, and troubleshoot three major types of AC systems: AC vector-type spindle drives, AC servo axis drives, and AC variable frequency drives. Students will receive training on how to provide accurate control of speed, position, and acceleration in applications such as CNC machine tools, conveyors, robots, mixers, and presses.

The Amatrol model 85-MT10-1 training equipment includes an isolation transformer, control station panel with control components and instrumentation, AC vector drive panel, AC servo drive panel, AC variable frequency drive panel, induction motor-inverter rated(w/encoder), AC servo motor, inertia load device and friction load device.

Curriculum:

1. **Introduction to AC Drives**

    a. Variable Frequency Drives
    b. Drive Categories and Levels
    c. Allen Bradley PowerFlex 70 Drive
    d. PowerFlex 70 Drive Configuration

2. **Configuring A-B PowerFlex 70 Drives**

    a. PowerFlex 70 Drive Parameter Organization
    b. Configuring and Tuning a PowerFlex 70 Drive
    c. Monitoring Drive Parameters

3. **A-B PowerFlex 70 Control Parameters**

    a. PowerFlex 70 Motor Control Parameters
    b. PowerFlex 70 Speed Command Parameters
    c. PowerFlex 70 Dynamic Control Parameters
    d. PowerFlex 70 Input and Output Parameters

4. **Communications and Diagnostics for A-B PowerFlex 70 Drives**

    a. Utility Parameters
    b. PowerFlex 70 Communications
    c. Owner and Diagnostic Parameters

5. **Troubleshooting A-B PowerFlex 70 Drives**

    a. Drive Faults
    b. VFD Troubleshooting
    c. Troubleshooting Inputs

6. **Configuring and Troubleshooting the A-B PowerFlex 40 Drive**

    a. General Purpose AC Drive Fundamentals
    b. Acceleration and Deceleration Control
    c. Torque Control
    d. Stop Modes
    e. General Purpose AC Drive troubleshooting

7. Configuring and Troubleshooting Servo Drive

    a. Basic AC Servo Drive Components
    b. AC Servo Feedback
    c. AC Drive Tuning
    d. AC Servo Drive Troubleshooting

Textbooks/Workbooks:

8 Amatrol Learning Activity Packet Booklets

Summary:

The AC Electronic Drives Training is an 8 hour per day, 3.5 day course.
Basic AC/DC electrical knowledge is required.
Cost: $1,050 per student includes lunch and books/LAPs

Discounts are available for multiple students attending from the same company.
Call Martha Vance to enroll @ 812-888-5284 or call Jerry Ruble @ 812-888-4346 for more information.

E24 – POWER & CONTROL ELECTRONICS

Description:

This course covers in-depth electronic power and control applications theory and hands-on skills. Students will study the concepts of solid state electronics as they apply to modern applications such as switching power supplies, analog and discrete sensing, solid state relays, transistors, PWM amplifiers, and variable speed motor control. Specifically, students will study objectives like the operation of a full-wave rectifier (AC to DC), the installation of a photoelectric sensor, and testing a triac relay circuit.

The Amatrol T7018 trainer features industrial-standard components that allow learners to practice with equipment they'll likely encounter on the job. The T7018 features: a power supply/semiconductor panel with potentiometers and test points; a temperature control panel with thermocouples, resistive temperature detectors, and thermistors; a speed/power control panel; an analog sensor/amplifier panel; and a discrete sensor panel. These panels and other components will allow learners to understand and troubleshoot basic industrial circuits. Specifically, learners will perform skills like testing the output of a current limiter, selecting a solid state relay, installing a capacitive proximity sensor, connecting two configurations of open-loop operational amplifier circuits, and designing a circuit that measures the level in a batch process.

Curriculum:

1. **Oscilloscopes**
   a. Oscilloscopes
   b. Waveform Measurements
   c. Probes

2. **Linear Power Supplies**
   a. Power Supply Types
   b. Power Supply Operation
   c. Diodes
   d. Half-Wave Rectifier
   e. Full-Wave Rectifier

3. **Power Supply Filtration and Regulation**
   a. Current Limiter
   b. Capacitive Filters
   c. Inductive Filters
   d. Combination Filters
   e. Regulation

4. **Solid State Relays**
   a. Transistors
   b. Solid State Relays
   c. Machine Interfacing

5. **Discrete Sensing Devices**
   a. Inductive Proximity Sensors
   b. Capacitive Proximity Sensors
   c. Photoelectric Sensors
   d. Hall Effect Sensors

6. **Thermal Sensing Devices**

   a. Thermistors
   b. Thermocouples
   c. Resistance Temperature Detector

7. **Amplifiers and Op-Amps**

   a. Transistor Amplifiers
   b. Amplifier Applications
   c. Linear Integrated Circuits
   d. Closed-Loop Op-Amp Circuits

8. **Analog Sensing Devices**

   a. Pressure Sensors
   b. Ultrasonic Sensors

9. **Solid State Switching**

   a. Field Effect Transistors (FETs)
   b. Insulated-Gate Bipolar Transistors (IGBTs)
   c. FET Speed Control Circuits
   d. Switching Power Supplies

10. **Solid State Speed and Power Control**

    a. Silicon-Controlled Rectifiers (SCRs)
    b. Triacs
    c. SCR Phase Control Circuits
    d. Triac Phase Control Circuits

Textbooks/Workbooks:
10 Amatrol Learning Activity Packet Booklets

Summary:
The Power & Control Electronics Training is an 8 hour per day, 5 day course.
Basic AC/DC electrical knowledge is required.
Cost: $1,500 per student includes lunch and books/LAPs

Discounts are available for multiple students attending from the same company. Call Martha Vance to enroll @ 812-888-5284 or call Jerry Ruble @ 812-888-4346 for more information.

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E30 - MASTERING PROGRAMMABLE CONTROLLERS
(A-B SLC 500/RSLogix 500)

Description:

This course is designed for those who are seeking basic training on SLC 500 style Allen-Bradley PLC's with RSlinx and RSLogix 500. We use the Amatrol model 890-PEC Programmable Controller Troubleshooting Learning System to teach programming and troubleshooting of programmable controllers and their use in industrial, commercial, and residential applications. The 890-PEC has the qualities of a real world machine with relay-controlled start/stop power station, terminal strip I/O test points, operator station, and machine automation station including electric motors, pneumatic cylinders and limit switches. Students study various applications with live devices by plugging in one or more of the many application panels. Each application panel models an actual machine system such as electro-pneumatic actuator, electric motor, analog devices and BCD/LED display.

Curriculum:

1. **Introduction to Programmable Controllers**

    a. PLC Orientation
    b. PLC Operation
    c. PLC Programming Languages

2. **Basic PLC Programming**

    a. Numbering Systems
    b. PLC Memory Organization
    c. PLC Program Analysis

3. **PLC Motor Control**

    a. Motor Control Basics
    b. Seal-In Program Logic
    c. Interlock Functions
    d. Documentation and Advanced Editing

4. **Discrete I/O Interfacing**

    a. Basic Input Interfacing
    b. Basic Output Interfacing
    c. Electronic Device Interfacing

5. **Introduction to PLC Troubleshooting**

    a. PLC Troubleshooting
    b. Power Supply Troubleshooting
    c. Input Troubleshooting
    d. Output Troubleshooting

6. **PLC Systems Troubleshooting**

    a. Processor Troubleshooting
    b. Systems Troubleshooting Techniques
    c. Software Troubleshooting Tools

7. Event Sequencing

    a. Introduction to Event Sequencing
    b. Continuous Cycle Logic
    c. Multiple Actuator Event Sequencing

8. Application Development

    a. Program Development
    b. Modes of Operation
    c. Stop Functions

9. PLC Timer Instructions

    a. Retentive Timer Instructions
    b. Non-Retentive Timer Instructions
    c. Time Driven Sequencing
    d. Timer Applications

10. PLC Counter Instructions

    a. Count UP Instruction
    b. Count Down Instruction
    c. BCD Thumbwheel Switches
    d. LED Displays

11. Program Control Instructions

    a. Program Initialization
    b. Master Control Reset
    c. Subroutines
    d. Jump and Label Instructions

12. Math and Data Move Instructions

    a. ADD Instruction
    b. Subtraction Instruction
    c. Multiply and Divide Instructions
    d. Move Instructions

Textbooks/Workbooks:
12 Amatrol Learning Activity Packet Booklets

Summary:
The Mastering Programmable Controller Training is an 8 hour per day, 6 day course.
Basic AC/DC Electrical knowledge is required.
Cost: $1,800 per student includes lunch and books/LAPs
Discounts are available for multiple students attending from the same company.
Call Martha Vance to enroll @ 812-888-5284 or call Jerry Ruble @ 812-888-4346 for more information.

E31 - MASTERING PROGRAMMABLE CONTROLLERS
(A-B ControlLogix 5500 and RSLogix 5000)

Description:

This course is designed for those who are seeking basic training on ControlLogix style Allen-Bradley PLC's with RSlinx and RSLogix 5000. We use the Amatrol model 890-PEC Programmable Controller Troubleshooting Learning System to teach programming and troubleshooting of programmable controllers and their use in industrial, commercial, and residential applications. The 890-PEC has the qualities of a real world machine with relay-controlled start/stop power station, terminal strip I/O test points, operator station, and machine automation station including electric motors, pneumatic cylinders and limit switches. Students study various applications with live devices by plugging in one or more of the many application panels. Each application panel models an actual machine system such as electro-pneumatic actuator, electric motor, analog devices and BCD/LED display.

Curriculum:

1. **Introduction to Programmable Controllers**

   a. PLC Orientation
   b. PLC Operation
   c. PLC Programming Languages

2. **Basic PLC Programming**

   a. PLC Programming Instructions
   b. Numbering Systems
   c. Project Creation and Organization
   d. Programming Software

3. **PLC Motor Control**

   a. PLC Program Analysis
   b. Motor Control Basics
   c. Seal-In Program Logic
   d. Data Types and User Defined Tags
   e. Interlock Functions

4. **Discrete I/O Interfacing**

   a. Basic Input Interfacing
   b. Basic Output Interfacing
   c. Electronic Device Interfacing

5. **PLC Timer Instructions**

   a. Retentive Timer Instructions
   b. Non-Retentive Timer Instructions
   c. Time Driven Sequencing and Applications

6. **PLC Counter Instructions**

   a. Count Up Instruction
   b. Count Down Instruction
   c. BCD Thumbwheel Switches
   d. LED Displays

7. Introduction to PLC Troubleshooting

    a. PLC Troubleshooting
    b. Power Supply Troubleshooting
    c. Input Troubleshooting
    d. Output Troubleshooting

8. PLC System Troubleshooting

    a. Processor Troubleshooting
    b. System Troubleshooting Techniques
    c. Program Documentation

9. Event Sequencing

    a. Introduction to Event Sequencing
    b. Continuous Cycle Logic
    c. Multiple Actuator Event Sequencing

10. Application Development

    a. Program Development
    b. Modes of Operation
    c. Stop Functions
    d. Timers and Counters

11. Program Control Instructions

    a. Program Initialization
    b. Master Control Reset
    c. Subroutines
    d. Jump and Label Instructions

12. Math and Data Move Instructions

    a. ADD Instruction
    b. Subtraction Instruction
    c. Multiply and Divide Instructions
    d. Move Instructions

Textbooks/Workbooks:
12 Amatrol Learning Activity Packet Booklets

Summary:
The Mastering Programmable Controller Training is an 8 hour per day, 6 day course (3 days the first week and 3 days the second week).
Basic AC/DC Electrical knowledge is required.
Cost: $1,800 per student includes lunch and books/LAPs
Discounts are available for multiple students attending from the same company.
Call Martha Vance to enroll @ 812-888-5284 or call Jerry Ruble @ 812-888-4346 for more information.

E32 – Analog Modules for ControlLogix
(A-B ControlLogix 5500)

Description:

This course is designed for those who are seeking training on ControlLogix style Allen-Bradley PLC's with Analog Input and Output modules installed in their rack. Analog Input and Output capability enables PLCs to more precisely control processes by providing variable output signals and receiving variable input feedback from sensors. Examples of industry applications include temperature control, liquid level control, and variable speed conveyors just to name a few.

Curriculum:

13. Analog Input Modules

    a. Sensors
    b. Module Installation
    c. Module Operation
    d. Editing Analog Input Configuration

14. Analog Input Configuration and Troubleshooting

    a. Comparison Instructions
    b. On/Off Control Using Analog Inputs
    c. Analog Input Alarms and Status
    d. Troubleshooting Analog Input Modules

15. Analog Output Modules

    a. Analog Output Devices
    b. Module Installation
    c. Module Operation
    d. Output Tag Structure

16. Analog Input Configuration and Troubleshooting

    a. Module Configuration
    b. Wireoff Fault Bits
    c. Troubleshooting Analog Output Modules

Textbooks/Workbooks:
4 Amatrol Learning Activity Packet Booklets

Summary:
The Analog Modules for ControlLogix Training is an 8 hour per day, 2 day course usually added on to the end of the ControlLogix PLC training class.
Basic AC/DC Electrical and ControlLogix PLC knowledge is required.
Cost: $600 per student includes lunch, snacks and LAPs
Discounts are available for multiple students attending from the same company.
Call Martha Vance to enroll @ 812-888-5284 or call Jerry Ruble @ 812-888-4346 for more information.

E33 – Industrial Communications Networks (DeviceNet for ControlLogix) (A-B ControlLogix 5500)

Description:

This course is designed for those who are seeking training on DeviceNet style industrial communications networks. High level, high-speed networks dedicated to field devices are replacing remote chassis, adapters, and I/O modules by connecting I/O devices directly to the PLC through a scanner. These field level networks provide a wider range of control for variable speed drives, robotics, and Human Machine Interface (HMI) terminals. It is important for the technician to understand the types of networks and their operation to be able to install and troubleshoot not only the networks, but the interconnections to the PLCs themselves.

Curriculum:

1. **Industrial Communications Networks**

    a. Network Operation
    b. Installation
    c. Module Configuration
    d. EtherNet/IP Configuration

2. **DeviceNet I/O**

    a. RSNetWorx for DeviceNet
    b. Downloading and the EDS Wizard
    c. Node Commissioning and Online Configuration

3. **DeviceNet Troubleshooting**

    a. DeviceNet Tags
    b. Introduction to DeviceNet Troubleshooting
    c. Intermittent and Multi-Node Troubleshooting

Textbooks/Workbooks:
3 Amatrol Learning Activity Packet Booklets

Summary:
The Analog Modules for ControlLogix Training is an 8 hour per day, 1.5 day course.
Basic AC/DC Electrical and ControlLogix PLC knowledge is required.
Cost: $450 per student includes lunch and books/LAPs
Discounts are available for multiple students attending from the same company.
Call Martha Vance to enroll @ 812-888-5284 or call
Jerry Ruble @ 812-888-4346 for more information.

E34 – Industrial Communications Networks (EtherNet/IP for ControlLogix) (A-B ControlLogix 5500)

Description:

This course is designed for those who are seeking training on EtherNet/IP style industrial communications networks. Rapid exchange of data between departments within a manufacturing facility has become an integral part of the production process. High-speed networks link sales, purchasing, shipping, production control and the PLCs on the plant floor together. It is important for the technician to understand the types of networks and their operation to be able to install and troubleshoot not only the networks, but the interconnections to the PLCs themselves.

Curriculum:

1. **Industrial Communications Networks**

   a. Network Operation
   b. Installation
   c. Configuration

2. **Remote I/O**

   a. Remote I/O Network Operation
   b. Configuration
   c. Remote I/O Tags

3. **Produced / Consumed Data and Messages**

   a. Data Transfers Between Controllers
   b. Produced and Consumed Data
   c. Using the Message Instruction

4. **Troubleshooting EtherNet/IP**

   a. Introduction to EtherNet/IP Troubleshooting
   b. Troubleshooting EtherNet/IP Networks
   c. Viewing EtherNet/IP Network Counters
   d. Troubleshooting the MSG Instruction

Textbooks/Workbooks:
4 Amatrol Learning Activity Packet Booklets

Summary:
The EtherNet/IP for ControlLogix Training is an 8 hour per day, 2 day course.
Basic AC/DC Electrical and ControlLogix PLC knowledge is required.
Cost: $600 per student includes lunch and books/LAPs
Discounts are available for multiple students attending from the same company.
Call Martha Vance to enroll @ 812-888-5284 or call Jerry Ruble @ 812-888-4346 for more information.

E35 – HMI's - Human Machine Interface (PanelView Plus 6 1000) (A-B ControlLogix 5500)

Description:

This course is designed for those who are seeking training on Allen Bradley PanelView style human machine interface (HMI).   HMI operator stations have become commonplace in modern industry because they eliminate wiring, enable operator functions to be modified in software, and provide the ability for the operator to monitor PLC operations data.

Curriculum:

1. **Introduction to PanelView Plus 6**

   a. PanelView Plus 6 Construction
   b. PanelView Plus 6 Configuration
   c. FactoryTalk View Studio – Machine Edition
   d. PanelView Plus 6 Application Transfer

2. **PanelView Plus 6 Application Editing 1**

   a. Tags and Communications
   b. Studio-ME Software Operation
   c. Input and Output Object

3. **PanelView Plus 6 Application Editing 2**

   a. Numeric Input/Output
   b. Editing Studio-ME Displays
   c. Local Messages
   d. Alarms, Diagnostic and Information Messages

Textbooks/Workbooks:
3 Amatrol Learning Activity Packet Booklets

Summary:
The PanelView Plus Training is an 8 hour per day, 1.5 day course.
Basic AC/DC Electrical and ControlLogix PLC knowledge is required.
Cost: $450 per student includes lunch and books/LAPs
Discounts are available for multiple students attending from the same company.
Call Martha Vance to enroll @ 812-888-5284 or call Jerry Ruble @ 812-888-4346 for more information.

A20 – Mechatronics

Description:

Our mechatronics learning system forms a fully automated line to teach real-world mechatronics skills. This learning system features a pick-and-place, gauging, and inventory station. Mechatronics is an integral part of the automotive, pharmaceutical and chemical industries, just to name a few. The impact and applications of mechatronics grows by the day, so industries need skilled workers who understand these complex systems. Your employee will get hands-on experience with Allen-Bradley MicroLogix 1000 PLC's, electronic sensors, basic pneumatic, conveyor and stepper motors.

Curriculum:

1. **Automation Operations**

    a. Introduction to Mechatronics
    b. Control System Concepts
    c. Mechatronics Safety
    d. Machine Operator Functions

2. **Introduction to Programmable Controllers**

    a. PLC Orientation
    b. PLC Operation
    c. PLC Programming Languages

3. **Basic PLC Programming**

    a. Numbering Systems
    b. PLC Programming Software
    c. PLC Program Analysis

4. **PLC Motor Control**
    a. Motor Control Basics
    b. Seal-In Program Logic
    c. Interlock Functions
    d. Documentation and Advanced Editing
    e. Program Development

5. **PLC Counter and Timer Instructions**
    a. Timer Instructions
    b. Time-Driven Sequencing
    c. Count Up Instructions

6. **Pick and Place Feeding**
    a. Station Operation
    b. Component Adjustment
    c. Vacuum Adjustment
    d. Introduction to Event Sequencing

7. **Event Sequencing**
   a. Continuous Cycle Logic
   b. Stop Functions
   c. Sequencing

8. **Indexing**
   a. Station Operation
   b. Component Adjustment
   c. Sequencing

9. **Parts Sorting and Storage**
   a. Station Operation
   b. Component Adjustment
   c. Sequencing
   d. Multiple Station Operation

Textbooks/Workbooks:
1 Tabletop Mechatronics Student Reference Book

Summary:
The Mechatronics Training is an 8 hour per day,
4.5 day course.
Basic AC/DC Electrical is required and Electric Motor Control is recommended.
Cost: $1,350 per student includes lunch and student book
Discounts are available for multiple students attending from the same company.
Call Martha Vance to enroll @ 812-888-5284 or call Jerry Ruble @ 812-888-4346 for more information.

C10 – THERMAL PROCESS CONTROL

Description:

This course is designed for those who are seeking basic training on process control systems (thermal). Students will learn to calibrate, adjust, install, operate, and tune thermal process control systems in industrial applications. The Amatrol T5553 trainer includes process control components which are mounted and plumbed in two water flow circuits, a process loop (refrigeration based) and heating loop, to control the temperature of water flowing in the process loop. All electrical components are connected to the control panel to allow students to measure signals and connect the devices in a wide variety of control configurations including PID control, on/off control, and manual control.

Curriculum:

1. **Introduction to Process Control**

    a. Process Control Concepts
    b. Safety
    c. Manual Control

2. **Instrument Tags**

    a. Block Diagrams
    b. Instrument Tag Fundamentals
    c. Interpreting Instrument Tags

3. **Piping and Instrumentation Diagrams**

    a. Line Symbols
    b. Valve and Pump Symbols
    c. Level and Flow Sensing Element Symbols
    d. Pressure and Temperature Sensing Element Symbols
    e. Instrument Index

4. **Thermal Energy**

    a. Temperature Measurement
    b. Thermal Energy
    c. Heat Transfer
    d. Thermal System Power

5. **Basic Temperature Control Elements**

    a. Process Heating
    b. Heat Exchangers
    c. Process Cooling
    d. Manual Process Temperature Control

6. **Loop Controllers**

    a. Loop Controllers
    b. Loop Control Parameters
    c. Manual Operation

7. **Final Control Elements**

    a. I/P Converter Operation
    b. I/P Converter Calibration
    c. Two-Way Proportional Control Valves
    d. Three-Way Proportional Control Valves

8. **Temperature Sensors**

    a. Thermocouples
    b. Resistive Temperature Detectors (RTDs)
    c. Thermistors
    d. Temperature Sensor Selection

9. **Temperature Transmitters**

    a. Temperature Transmitters
    b. Temperature Transmitter Configuration for a Thermocouple
    c. Temperature Transmitter Configuration for a RTD
    d. Temperature Transmitter Configuration for a Thermistor

10. **Basic Temperature Control**

    a. On/Off Temperature Control
    b. Closed Loop Temperature Control
    c. Alarms
    d. Discrete Inputs

11. **Methods of Automatic Control**

    a. Performance Concepts
    b. Proportional Control (P)
    c. Proportional-Integral Control (PI)
    d. Proportional-Integral-Derivative Control (PID)

12. **Control Loop Performance**

    a. Resolution
    b. Accuracy and Repeatability
    c. Manual Loop Tuning
    d. Automatic Loop Tuning

Textbooks/Workbooks:
12 Amatrol Learning Activity Packet Booklets

Summary:
The Temperature Process Control Training is an 8 hour per day, 6 day course.
Basic AC/DC Electrical knowledge is required.
Cost: $1,800 per student includes lunch and books/LAPs
Discounts are available for multiple students attending from the same company.
Call Martha Vance to enroll @ 812-888-5284 or call Jerry Ruble @ 812-888-4346 for more information.

HYDRAULICS TRAINING

Description:

This course is designed for those who are seeking basic hydraulics training. We use the Amatrol 850 training units. Students will first learn about the physical principles of hydraulics and how hydraulic mechanisms are used in real world applications. From this block, learners will begin constructing hydraulic circuits, which gradually increase in difficulty and number of industry-standard components as the curriculum goes along. By taking this approach, learners will understand each component's function in a circuit, which will make troubleshooting easier in later lessons and on more advanced learning systems. Students will learn about pumps, gauges, hydraulic motors, cylinder and numerous valves, including schematic symbols for each component, which will help them read and draw their own hydraulic schematics.

Curriculum: (H10 - Hydraulics I)

1. **Hydraulic Power Systems**

    a. Introduction to Hydraulics
    b. Power Unit Operation
    c. Circuit Connections
    d. Base cylinder circuits

2. **Basic Hydraulic Circuits**

    a. Pumps
    b. Needle Valves
    c. Basic Motor Circuits
    d. Hydraulic Schematics

3. **Principles of Hydraulic Pressure and Flow**

    a. Pressure Vs. Cylinder Force
    b. Hydraulic Leverage
    c. Fluid Friction
    d. Absolute Vs. Gauge Pressure

4. **Hydraulic Pressure and Flow**

    a. Relief Valves
    b. Check Valves
    c. Flow Control Valves
    d. Meter-In and Meter-Out Circuits
    e. Flow Control Circuit Design
    f. Flow Rate Vs. Cylinder Speed

5. **Pressure Control Circuits**

    a. Sequence Valves
    b. Sequence Valve Applications
    c. Pressure Reducing Valves
    d. PRV Applications

Curriculum: (H20 - Hydraulics II)

1. Hydraulic Directional Control Valve Applications

    a. Overview of the DCV
    b. Two Position DCV's
    c. Pilot-Operated DCV's
    d. Cam-Operated DCV's

2. Hydraulic Cylinder Applications

    a. Cylinder Types
    b. Regeneration Circuits
    c. Pressure-Compensated Flow Control Valves
    d. Synchronization Circuits

3. Hydraulic Relief Valve Applications

    a. Pilot-Operated Relief Valves
    b. Pump Unloading Applications
    c. Remote Pressure Control

4. Hydraulic Check Valve Applications

    a. Pressure Port Check Valve Circuit
    b. Pilot-Operated Check Valves
    c. Pilot-Operated Check Valve Applications
    d. Pilot-Operated Check Valve Circuit Design

5. Accumulator Applications

    a. Accumulator Operation
    b. Accumulator Circuits
    c. Accumulator Applications
    d. Accumulator Sizing

Curriculum: (H30 - Hydraulics III)

1. Hydraulic Motor Applications

    a. Hydraulic Motor Types
    b. Motor Applications
    c. Free-Wheeling Motor Circuits
    d. Unidirectional Motor Braking
    e. Bidirectional Motor Braking

2. Hydraulic Pump and Motor Performance

    a. Pump Flow Rate
    b. Pump Power
    c. Hydraulic Motor Displacement
    d. Hydraulic Motor Torque

3. Fluids and Conditioning

   a. Conductors
   b. Fluid Viscosity
   c. Fluid Compressibility
   d. Filtration
   e. Reservoirs and Heat Exchangers

Textbooks/Workbooks:
Hydraulics I: 5 Amatrol Learning Activity Packet Booklets
Hydraulics II: 5 Amatrol Learning Activity Packet Booklets
Hydraulics III: 3 Amatrol Learning Activity Packet Booklets

Summary:
The Hydraulics I Training is an 8 hour per day, 2.5 day course.
The Hydraulics II Training is an 8 hour per day, 2.5 day course immediately following Hydraulics I.
The Hydraulics III Training is an 8 hour per day, 1.5 day course immediately following Hydraulics II.
Cost: Hydraulics 1: $750 per student; includes lunch and books/LAPs
            Hydraulics II: $750 per student; includes lunch and books/LAPs
            Hydraulics III: $450; includes lunch and books/LAPs
Discounts are available for multiple students attending from the same company.
Call Martha Vance to enroll @ 812-888-5284 or call Jerry Ruble @ 812-888-4346 for more information.

PNEUMATICS TRAINING

Description:

This course is designed for those who are seeking basic pneumatics training. We use the Amatrol 850 Basic Fluid Power Learning System to teach fundamental pneumatic systems used in industrial, commercial, agricultural, and mobile applications. Students learn industry-relevant skills including how to operate, install, analyze performance, and design basic pneumatic power systems. The model 850 includes a filter/regulator, pneumatic motor, cylinders, various valves, manometer, flow meter, gauges and pneumatic hose and fittings set.

Curriculum: (P10 - Pneumatics I)

1. **Pneumatic Power Systems**

    a. Introduction to Pneumatics
    b. Pneumatic Power
    c. Circuit Connections
    d. Base cylinder circuits

2. **Basic Pneumatic Circuits**

    a. Single-Acting Cylinder Circuits
    b. Basic Motor Circuits
    c. Pneumatic Schematics

3. **Principles of Pneumatic Pressure and Flow**

    a. Pressure Vs. Cylinder Force
    b. Pneumatic Leverage
    c. Pressure and Volume
    d. Air Flow and Resistance

4. **Pneumatic Speed Control Circuits**

    a. Air Flow Control and Measurement
    b. Flow Control Valves
    c. Speed Control

Curriculum: (P15 - Pneumatics II)

1. **Pneumatic Directional Control Applications**

   a. Cam Valves
   b. Cam Valve Applications
   c. Two-Way Valves

2. **Air Logic**

   a. Externally Piloted Valves
   b. Introduction to Air Logic
   c. Air Logic Design

3. **Pneumatic Maintenance**

   a. Air Filtration
   b. Water Removal
   c. Lubrication
   d. Servicing Pneumatic Components

Curriculum: (P20 - Pneumatics III)

1. **Moving Loads Pneumatically**

   a. Pneumatic Cylinder Loads
   b. Cylinder Applications
   c. Component Sizing
   d. Pneumatic Motor Loads
   e. Air Bearings

2. **Vacuum Systems**
   a. Vacuum Gauges
   b. Manometers
   c. Vacuum Generators
   d. Vacuum Applications

3. **Air Compressors**
   a. Compressor Types
   b. Reciprocating Compressor Systems
   c. Compressor Flow Concepts
   d. Compressor Performance

Textbooks/Workbooks:
Pneumatics I: 4 Amatrol Learning Activity Packet Booklets
Pneumatics II: 3 Amatrol Learning Activity Packet Booklets
Pneumatics III: 3 Amatrol Learning Activity Packet Booklets

Summary:
The Pneumatics I Training is an 8 hour per day, 2 day course. Cost: $600 per student
The Pneumatics II Training is an 8 hour per day, 1.5 day course immediately following Pneumatics I. $450
The Pneumatics III Training is an 8 hour per day, 1.5 day course immediately following Pneumatics II. $450
Discounts are available for multiple students attending from the same company.
Call Martha Vance to enroll @ 812-888-5284 or call Jerry Ruble @ 812-888-4346 for more information.

P22 - PNEUMATIC TROUBLESHOOTING

Description:

This course is designed for those who are seeking pneumatic systems troubleshooting and advanced pneumatic systems training. To develop your troubleshooting skills, we first cover how to test for failures in each type of pneumatic component while the component is still attached to the system. We then cover methodical troubleshooting procedures that will help you apply these tests in an efficient manner in order to locate the problem as quickly as possible. We use the Amatrol 950-PT1 trainer to insert faults into the system to provide realistic practice in industrial troubleshooting.

Curriculum:

1. **Introduction to Pneumatic Troubleshooting**
    a. Pneumatic Troubleshooting Concepts
    b. Safety
    c. In-Circuit Pneumatic Component Testing

2. **Air Preparation Troubleshooting**
    a. Filter Troubleshooting
    b. Lubricator Troubleshooting
    c. Regulator Troubleshooting

3. **Troubleshooting Pneumatic Cylinders**
    a. Pneumatic Cylinder Troubleshooting
    b. Rodless Cylinder Troubleshooting
    c. Air-Over-Oil System Troubleshooting I
    d. Air-Over-Oil System Troubleshooting II

4. **Motor and Rotary Actuator Troubleshooting**
    a. Motor Troubleshooting
    b. Rotary Actuator Operation
    c. Rotary Actuator Troubleshooting

5. **Troubleshooting DCV and Flow Control Valves**
    a. Directional Control Valve Troubleshooting
    b. Flow Control Valve Troubleshooting
    c. Quick Exhaust Valves
    d. Exhaust Restrictors

6. **Troubleshooting Vacuum Systems**
    a. Troubleshooting Vacuum Cups and Generators
    b. Vacuum Switch Operation
    c. Vacuum Switch Troubleshooting

7. **Troubleshooting Pneumatic Systems**
    a. Troubleshooting Systems
    b. Troubleshooting Systems Level Faults
    c. Troubleshooting Machine Sequence Faults
    d. Troubleshooting Machine Performance Faults

Textbooks/Workbooks:
7 Amatrol Learning Activity Packet Booklets

Summary:
The Pneumatic Troubleshooting Training is an 8 hour per day, 3.5 day course
Basic pneumatic knowledge is required.
Cost: $1,050 per student includes lunch and books/LAPs
Discounts are available for multiple students attending from the same company.
Call Martha Vance to enroll @ 812-888-5284 or call Jerry Ruble @ 812-888-4346 for more information.

P24 – Electro-Fluid Power Systems

Description:

This course is designed for those who are seeking a combination of basic electrical control and pneumatic/hydraulic systems training. Electro-Fluid Power introduces electrical control systems and discusses basic control devices, power devices, control relays, sequencing control, timer control, pressure control applications, and circuit applications. Also discussed in depth to provide further skills is automatic and electrical control concepts and devices, logic elements, hydraulic and pneumatics solenoid-operated valves, relay and motor control applications, safety circuits and modes of operation.

Curriculum:

1. **Introduction to Electrical Control Systems**
   a. Introduction to Automatic Control
   b. Electrical Control Concepts
   c. Logic Elements 1
   d. Logic Elements 2

2. **Basic Control Devices**
   a. Ladder Diagrams
   b. Indicators
   c. Pushbuttons
   d. Selector Switches

3. **Power Devices**
   a. Hydraulic Solenoid-Operated Valves
   b. Pneumatic Solenoid-Operated Valves
   c. Circuit Protection and Transformers

4. **Control Relays**
   a. Relay Operation
   b. Relay Applications
   c. Motor Control Applications

5. **Sequencing Control**
   a. Limit Switch Operation
   b. Cylinder Sequencing
   c. Multiple Cylinder Control

6. **Timer Control**
   a. Time-Delay Relays
   b. Timer Applications
   c. Photoelectric Sensor Operation
   d. Photoelectric Sensor Applications

7. **Pressure Control Applications**
   a. Solenoid-Operated Relief Valves
   b. Solenoid-Operated Relief Valve Applications
   c. Pressure Switch Operation
   d. Pressure Switch Applications

8. Circuit Applications

   a. Safety Circuits
   b. Modes of Operation
   c. Rapid Traverse-Slow Feed

Textbooks/Workbooks:
8 Amatrol Learning Activity Packet Booklets

Summary:
The Electro-Fluid Power Training is an 8 hour per day, 4 day course
Basic AC/DC knowledge is required.
Cost: $1,200 per student includes lunch and books/LAPs
Discounts are available for multiple students attending from the same company.
Call Martha Vance to enroll @ 812-888-5284 or call Jerry Ruble @ 812-888-4346 for more information.

A10 - AIR CONDITIONING/HEAT PUMP TROUBLESHOOTING TRAINING

Description:

Thermal system troubleshooting skills are in high demand today with these systems playing a key role in industrial, commercial and residential applications to provide heating and cooling of spaces and processes. We use the T7082A Air Conditioning/Heat Pump Troubleshooting Learning System to teach these valuable troubleshooting skills. This is a hands-on learning station that contains a working system that can perform heat pump, air conditioning and refrigeration operation and a wide array of faults that can be inserted.

The model T7082A uses the principle of vapor compression and offers three different types of expansion methods, enabling students to explore a wide range of thermal application and system designs. The trainers are specially designed as a teaching system with its components arranged in a breadboard fashion to make it easy for students to follow the system flow and understand its operation. Extensive instrumentation is also provided so that students can better learn how these systems operate and how to improve performance.

The T7082A includes many instrumentation features to observe and monitor system operation. Sight glasses are located at three points on both the evaporator and condenser coils to show how the refrigerant changes phase as it passes through each coil. Pressure and temperature gauges are placed at the inlet and outlet of the condenser and evaporator to determine heating and cooling performance. Other teaching components include moisture indicator, panel-mounted compressor ammeter, and flow meter.

The trainer can replicate a variety of performance conditions with features such as heavy-duty industry blowers, attached to the condenser and evaporator coils, and manual valves placed throughout the refrigeration system. The blowers have dampers that can vary the flow across the coils, showing the effect of varying heat transfer rates. Manual valves are used to restrict the flow of refrigerant and change the amount of refrigerant in the system by allowing it to flow into or out of the accumulator.

Curriculum:

1. **Introduction to Refrigeration**

    a. Introduction to Refrigeration Systems
    b. Temperature Units
    c. Pressure Units
    d. Temperature/Pressure Measurement

2. **Compressors**

    a. Internal Energy
    b. Compressor Operation

3. **Condensers**

    a. Heat Transfer
    b. Phase Change Effects
    c. Condenser Operation
    d. Condenser Performance

4. **Metering Devices and Evaporators**

   a. Metering Devices
   b. Automatic and Thermostatic Expansion Valves
   c. Evaporators
   d. Heat Exchanger's Heat Duty and Thermal Cycle

5. **Temperature and Pressure Control Devices**

   a. Thermostats and Thermistors
   b. Dual-Pressure Control Device
   c. Suction Line Accumulators and Receivers
   d. Filter/Dryers and Moisture Indicators

6. **Reversing Valves and Refrigerants**

   a. Heating Mode Operation
   b. Heat Pump/Refrigeration Performance
   c. Refrigerants

7. **Thermal Troubleshooting Measurements**

   a. Introduction to Thermal Troubleshooting
   b. Temperature Measurement
   c. Pressure Measurement
   d. Electrical Measurement

8. **Component Level Troubleshooting 1**

   a. Blockage and Restriction Tests
   b. Refrigerant Charge Tests
   c. Compressor Tests

9. **Component Level Troubleshooting 2**

   a. Metering Valve Tests
   b. Temperature Controller Tests
   c. Reversing Valve Tests
   d. Blower Tests

10. **System Level Troubleshooting**

    a. Troubleshooting Methods
    b. Cooling Mode Troubleshooting
    c. Heating Mode Troubleshooting
    d. Heating and Cooling Mode Troubleshooting

Textbooks/Workbooks:
10 Amatrol Learning Activity Packet Booklets

Summary:
The Air Conditioning/Heat Pump Troubleshooting Training is an 8 hour per day, 5 day course.
Cost: $1,500 per student includes lunch and books/LAPs
Discounts are available for multiple students attending from the same company.
Call Martha Vance to enroll @ 812-888-5284 or call Jerry Ruble @ 812-888-4346 for more information.

MECHANICAL DRIVES TRAINING

Description:

Mechanical Drives I training teaches fundamentals of mechanical transmission systems used in industrial, agricultural, and mobile applications. Students will learn industry-relevant skills including how to operate, install, analyze performance, and design basic mechanical transmission systems using chains, v-belts, spur gears, bearings, and couplings. Safety is emphasized throughout the curriculum using lockout/tagout, safety disconnect switch, and rotating machine guards. The trainers feature the unique ability to measure the performance of each mechanical transmission setup, showing students the effects of proper alignment and how to obtain best efficiency. The system includes a prony brake that places a variable load on each setup and instrumentation that measures speed, torque, and current.

Mechanical Drives IV adds linear axis drives, clutches, and brakes to the equipment supplied with Mechanical Drives I. The trainer includes components for assembling a precision axis drive system with angular contact bearings, precision ball screw, linear bearings and structure, cam clutch, friction clutch, flywheel, and electrical control unit.

Curriculum: (M10 – Mechanical Drives I)

1. **Introduction to Mechanical Drive Systems**

   a. Mechanical Power Transmission Safety
   b. Machine Installation
   c. Motor Mounting
   d. Shaft Speed Measurement

2. **Key Fasteners**

   a. Keyseat Fasteners
   b. Key Assembly
   c. Torque and Power Measurement
   d. Mechanical Efficiency

3. **Power Transmission Systems**

   a. Introduction to Shafts
   b. Introduction to Bearings
   c. Introduction to Couplings
   d. Shaft Alignment

4. **Introduction to V-Belt Drive**

   a. Belt Drive Concepts
   b. V-Belt Operation
   c. Belt Tensioning
   d. Belt Tensioning Measurement

5. Introduction to Chain Drives

    a. Chain Drive Concepts
    b. Chain Drive Operation
    c. Chain Tensioning
    d. Fixed Center Chain Installation

6. Spur Gear Drive

    a. Gear Drive Concepts
    b. Gear Drive Designs
    c. Spur ear Operation
    d. Spur Gear Installation
    e. Spur Gear Analysis

7. Multiple Shaft Drives

    a. Multiple Shaft Gear Analysis
    b. Multiple Shaft Drive Installation
    c. Sleeve Couplings

Curriculum: (M30 – Mechanical Drives III)

1. Plain Bearings

    a. Solid Plain Bearings
    b. Plain Bearing Lubrication
    c. Plain Bearing Selection
    d. Plain Bearing Maintenance and Troubleshooting

2. Ball Bearings

    a. Introduction to Antifriction Bearings
    b. Ball Bearing Identification
    c. Mechanical Bearing Installation
    d. Temperature Bearing Installation

3. Roller Bearings

    a. Roller Bearing Identification
    b. Mechanical Installation
    c. Temperature Installation
    d. Roller Bearing Applications

4. Antifriction Bearing Selection and Maintenance

    a. Angular-Contact Bearings
    b. Bearing Lubrication
    c. Antifriction Bearing Selection
    d. Antifriction Bearing Maintenance/Troubleshooting

5. Gaskets and Seals

    a. Gaskets
    b. O-Ring Seals
    c. Lip Seals
    d. Mechanical Seals
    e. Seal Maintenance and Selection

6. Advanced Gear Drives

    a. Helical Gear Drives
    b. Right Angle Gear Drives
    c. Speed Reducers
    d. Speed Reducer Maintenance

7. Gear Drive Selection and Maintenance

    a. Gear Drive Selection
    b. Gear Lubrication
    c. Gear Drive Maintenance and Troubleshooting

Curriculum: (M40 – Mechanical Drives IV)

1. Brakes and Clutches

    a. Brake and Clutch Concepts
    b. Brakes
    c. Friction Clutches
    d. Cam Clutches

2. Brake/Clutch Selection and Measurement

    a. Brake/Clutch Combinations
    b. Brake and Clutch Selection
    c. Brake/Clutch Maintenance

3. Linear Ball Bushings

    a. Linear Drives
    b. Linear Ball Bushing Applications
    c. Linear Ball Bushing Identification
    d. Linear Ball Bushing Maintenance and Selection

4. Ball Screw Drives

    a. Ball Screw Operation
    b. Ball Screw Applications
    c. Ball Screw Identification
    d. Ball Screw Selection and Maintenance

Textbooks/Workbooks:

Mechanical Drives I: 7 Amatrol Learning Activity Packet Booklets
Mechanical Drives III: 7 Amatrol Learning Activity Packet Booklets
Mechanical Drives IV: 4 Amatrol Learning Activity Packet Booklets

Summary:

The Mechanical Drives 1 Training is an 8 hour per day, 3.
5 day course.
Cost of Mechanical Drives I: $1,050 per student, includes lunch and books/LAPs.
The Mechanical Drives 3 Training is an 8 hour per day, 3.5 day course.
Cost of Mechanical Drives I: $1,050 per student, includes lunch and books/LAPs.
The Mechanical Drives 4 Training is an 8 hour per day, 2 day course.
Cost of Mechanical Drives IV: $600 per student, includes lunch and books/LAPs.
Discounts are available for multiple students attending from the same company.
Call Martha Vance to enroll @ 812-888-5284 or call Jerry Ruble @ 812-888-4346 for more information.

US419
IRC5 Operator Training

The course goal is to teach students how to operate and modify the robot programs using the teach pendant.

Topics include

– Safety precautions used while programming and program execution
– Operating controls and indicators on the robot controller
– Positioning the robot by use of joystick control
– Basic program modification techniques

Course objectives

After successfully completing the course, the participant should be able to:

– Practice Safety as it pertains to the robot system
– Identify and use the FlexPendant
– Run the robot in manual mode and automatic mode
– Interpret and respond to event messages
– Load, save and edit basic programs using the FlexPendant
– Modify movement instructions in a basic program
– Understand the use of input and output instructions in a basic program
– Manually manipulate I/O to activate and deactivate tooling
– Perform Hot Editing of program positions

Student profile

This course is intended for personnel responsible for starting and operating the robot.

- Operators and non-skilled laborers

Prerequisites

No formal requirements.

Duration

Course duration is 2 days.

To sign up for ABB robot training call:

ABB University - US
ABB Inc.
Phone: 1-800 HELP 365 (1-800-435-7365)
Option 2 then Option 4
Telefax: 1 919-666-1388
email: abbuniversity@us.abb.com

Ask ABB to schedule your training at Vincennes University

Or, go to www.abb.us/roboticstraining
And click on "click here to enroll in a course"

Jerry Ruble – Vincennes University
Phone: 812-888-4346
E-Mail: jruble@vinu.edu

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US420
IRC5 Programming I

The course goal is to teach students how to operate and program the robot using the teach pendant.

Topics include

– Safety precautions used while programming and program execution
– Operating controls and indicators on the robot controller
– Positioning the robot by use of joystick control
– Program creation procedures
– Basic program modification techniques

Course objectives

After successfully completing the course, the participant should be able to:

– Practice Safety as it pertains to the robot system
– Properly startup, operate, and shut down the robot
– Properly identify and recover from robot errors
– Perform program storage and retrieval
– Manual and program control of inputs and outputs
– Create tool center point data
– Edit programmed positions
– Create a program with subroutine structure
– Perform editing techniques
– Program instructions, such as, output control, decision making, operator dialog, and clock
– Create data with proper names
– Use module programming techniques
– Define work objects

Student Profile

This course is intended for personnel responsible for starting and operating the robot, creating programs and editing programs.

– Engineers
– Service Personnel
– Supervisory Personnel
– System integrators

Prerequisites

– No formal requirements
– Understanding of Windows or computer programming is helpful

Duration

– Course duration is 4.5 days

To sign up for ABB robot training call:

ABB

ABB University - US
ABB Inc.
Phone: 1-800 HELP 365 (1-800-435-7365)
Option 2 then Option 4
Telefax: 1 919-666-1388
email: abbuniversity@us.abb.com

Ask ABB to schedule your training at Vincennes University

Or, go to www.abb.us/roboticstraining
And click on "click here to enroll in a course"

Jerry Ruble – Vincennes University
Phone: 812-888-4346
E-Mail: jruble@vinu.edu

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US421
IRC5 Electrical Service

The course is designed to teach students how to identify the electrical components, theory of operation, and introduce proper troubleshooting procedures on the IRC5 robot controller. Approximately 50% of the course is hands-on troubleshooting of actual robot system and controller.

Topics include

- Theory of operation of the IRC5 robot controller
- Safety precautions used while troubleshooting the IRC5 robot controller electrical system
- Description of components in the IRC5 robot controller
- Principles of logical troubleshooting from power up through emergency stop loop and servo system
- Input/Output interfacing between the IRC5 robot controller and peripheral equipment

Student Profile

- Industrial electricians
- Electrical Service Technicians
- Engineers
- Supervisory Personnel

Prerequisites

- Familiarity with use of electronic test equipment (voltmeter)
- Basic understanding of digital electronics is helpful
- IRC5 robot programming US420 is recommended

Duration

- Course duration is 4.5 days

Course objectives

After successfully completing the course, the participant should be able to:

- Operate the IRC5 control panel and programming unit
- Read and interpret ABB circuit diagrams on the IRC5 robot controller
- Analyze and interpret system fault codes
- Diagnose and repair basic electrical faults
- Analyze servo-system data and make basic adjustments
- Diagnose and rectify emergency stop conditions
- Make I/O connections to peripheral equipment and safety devices
- Repair and replacement of systems components
- Review "Restart" procedures

To sign up for ABB robot training call:

ABB University - US
ABB Inc.
Phone: 1-800 HELP 365 (1-800-435-7365)
Option 2 then Option 4
Telefax: 1 919-666-1388
email: abbuniversity@us.abb.com

Ask ABB to schedule your training at Vincennes University

Or, go to www.abb.us/roboticstraining
And click on "click here to enroll in a course"

Jerry Ruble – Vincennes University
Phone: 812-888-4346
E-Mail: jruble@vinu.edu

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US425
IRC5 Programming II

The goal of this course is to provide instruction in high level programming features and techniques. Designed for students who have successfully completed the IRC5 Programming I class (US420 or US312) and who need a greater depth of knowledge. This course does not provide a review of IRC5 Programming I (US420 or US312). This class starts where the IRC5 Programming I class (US420 or US312) left off.

Topics include
- Building and configuring Robot Software
- Online and offline program editing
- Advanced declarations of modules, routines and data
- Programming with interrupts and traps
- Searching and program displacements
- Error handling, backward handling and undo handling
- Advanced motion Instruction
- World zones

Student Profile
This course is intended for students that have attended the IRC5 Programming I (US420 or US312) course but require greater knowledge of programming features.
- System programmers or technicians with existing / developing programming skills.

Prerequisites
-- IRC5 Programming I (US420 or US312)

Duration
-- Course duration is 4.5 days

Course objectives
After successfully completing the course, the participant should be able to:

- Create, configure and download software
- Create and use modules, routine and data
- Create advanced tool center points
- Program search instructions
- Program position displacement instructions
- Program error handling instructions
- Program interrupt instructions and traps
- Use joint configuration instructions
- Use motion control instructions

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US490
IRC5 Programming I for Welding

The goal of the course is to train the student to safely use the teach pendant to create weld programs, set and change weld data and edit existing programs. This course is designed for the IRB140, IRB1400, 1600 and 2400.
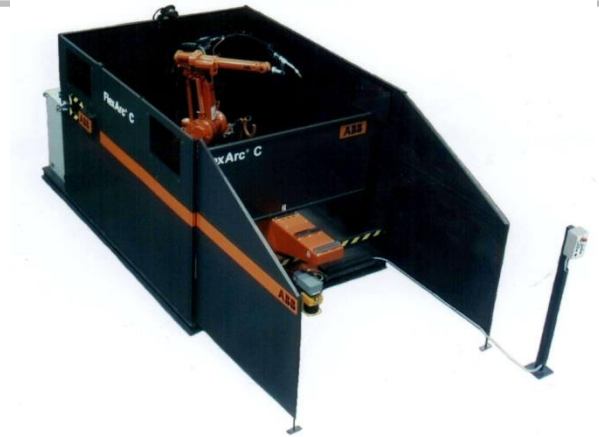
Topics include
- Safety precautions while programming and operating the robot system
- Operator controls and indicators on the teach pendant and operators panel
- Correct positioning of the robot using the teach pendant and various motion types
- Production Manager structure and operation
- ArcWare program commands and functions
- Teach pendant menus and displays for entry of welding routines, program commands and functions
- Positioning of the part using a positioned
- Setting up and using the ABB "BullsEye" device to create and check tool center points

Course objectives
After completing the course, the participant should be able to:
- Safely operate robot welding cell
- Create routines using proper structure
- Understand and use the "Production Manager" program to create new welded part programs and modify existing programs
- Save and load part programs to and from USB memory
- Understand and save system parameters
- Use the positioner to properly orient the part for welding
- Recognize and recover from basic system errors

Student Profile
- Welding cell programmers and engineers

Prerequisites
- GMAW training or similar welding experience
- Microsoft PC operating training or experience with Windows

Duration
- Course duration is 4.5 days

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Phone: 812-888-4346

E-Mail: jruble@vinu.edu

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For Schedules and locations of Industrial Maintenance and ABB Robotics training, please visit our website(s).

Website: *http://www.vinu.edu/web/guest/industrial-maintenance*

and

Website: *www.abb.us/roboticstraining*

To enroll, contact:
Martha Vance
Email: mvance@vinu.edu
Phone: 812-888-5284

For more information, contact:
Jerry Ruble
Director, Industrial Maintenance and ABB Robotics Training
Indiana Center for Applied Technology (ICAT), Room 105
Vincennes University
Email: jruble@vinu.edu
phone: 812-888-4346
cell: 812-890-6702

Hubie Holland
Instructor, Industrial Maintenance Training
Email: hholland@vinu.edu
Phone: 812-888-4413

Brandon Mullen
Instructor, Industrial Maintenance Training (Lebanon, IN)
Email: bmullen@vinu.edu
Phone: 317-381-6072