

Snead State Community College

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Cherri Barnard
256.840.4152
cbarnard@snead.edu

Teresa Walker
256.840.4211
twalker@snead.edu

Register Here:
www.snead.edu/tbiregistration

\$100.00 per student, per class

Introduction to PLC Programming

This course introduces Allen Bradley ControlLogix Programmable Controllers by describing PLC orientation, operations, and programming languages. It covers basic PLC Programming by describing numbering systems, PLC memory organization, PLC programming software and PLC program analysis. PLC motor control, discrete input and output interfacing, PLC timer and counter instructions are also discussed to give a better application of Programmable Controllers. This course also introduces PLC troubleshooting by discussing levels of PLC troubleshooting, power supply troubleshooting, input troubleshooting and output troubleshooting. Skills also discussed include PLC Systems troubleshooting, event sequencing, application development, program control instructions, and math and data move instructions.

- * **Intro to Programmable Controllers**
- * **Basic PLC Programming**
- * **PLC Motor Control**
- * **Discrete I/O Interfacing**
- * **PLC Timer Instructions**
- * **PLC Counter Instructions**
- * **Introduction to PLC Troubleshooting**
- * **PLC Systems Troubleshooting**
- * **Event Sequencing**
- * **Application Development**
- * **Program Control Instructions**
- * **Math and Data Move Instructions**

Intermediate PLC Programming

This intermediate course covers ControlLogix PLC operation and basic program instructions, PLC project elements, PLC motor control, PLC event sequencing, counter and timer instructions, PLC Ethernet operation, HMI Ethernet operation, and component and system troubleshooting. This course also teaches a wide variety of program commands, ranging from analog input and output, 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.

- * **Programmable Controller Operation**
- * **PLC Project Elements**
- * **Industrial Communications Networks**
- * **PLC Ethernet Communication**
- * **Remote I/O**
- * **Analog Inputs**
- * **Analog Outputs**
- * **Variable Output Applications**
- * **PLC Motion Control**
- * **PLC Event Sequencing 2**
- * **Produced/Consumed Data and Messages**
- * **Introduction to AC Variable Frequency Drives**
- * **AC Variable Frequency Drives - Speed and Torque Control**
- * **AC Variable Frequency Drives - Acceleration/Deceleration and Braking**
- * **HMI Ethernet Operation**
- * **Basic PanelView Plus Terminal Operation**
- * **PanelView Plus Application Editing**
- * **PanelView Plus Application Editing 2**
- * **Component Troubleshooting**
- * **System Troubleshooting**



Introduction to PLC Programming

This course introduces Allen Bradley ControlLogix Programmable Controllers by describing PLC orientation, operations and programming languages. It covers basic PLC programming by describing numbering systems, PLC memory organization, PLC programming software and PLC program analysis. PLC motor control, discrete input and output interfacing, PLC timer and counter instructions are also discussed to give better application of Programmable Controllers. This course also introduces PLC troubleshooting by discussing levels of PLC troubleshooting, power supply troubleshooting, input and output troubleshooting. Skills also discussed include PLC systems troubleshooting, event sequencing, application development, program control instructions, and math and data move instructions.

Outline

1. Introduction to Programmable Controllers

Segment 1 - PLC Orientation

Objective 1 - Describe the Function of a Programmable Logic Controller and Give an Application

Objective 2 - List Six Advantages of a PLC

Objective 3 - Describe the Functions of the Six Basic Components of a PLC

Skill 1 - Identify the Components of a PLC

Self Review 1

Segment 2 - PLC Operation and Communications

Objective 4 - Name Three Methods of Entering a PLC Program and Give an Advantage of Each

Objective 5 - Describe the Basic Operation of a PLC

Skill 2 - Open a Processor File Using PLC Software

Objective 6 - Describe the Function of RSLinx Software and Give an Application

Objective 7 - Describe the Function of a Communications Driver

Objective 8 - Describe the Function and Basic Operation of Serial Communication and Give an Example

Objective 9 - Describe the Five Components of the RSLinx Communications Software

Skill 3 - Download a PLC Processor File Using PLC Programming Software

Self Review 2

Segment 3 - Monitoring PLC Operation

Objective 10 - Describe the Function of the Who Active Utility and Its Components

Objective 11 - Describe How to Use the Who Active Utility to Monitor the Operation of a PLC

Skill 4 - Monitor PLC Operation Using PLC Programming Software

Skill 5 - Run a PLC Processor Project Using PLC Programming Software

Skill 6 - Stop a PLC Processor Project Using PLC Programming Software

Self Review 3

Segment 4 - Nonvolatile Memory and Memory Backup

Objective 12 - Describe the Function of Nonvolatile Memory and Give an Application

Objective 13 - Describe the Function of a Secure Data Memory Card

Objective 14 - Describe the Steps to Store a PLC Image to an SD Card

Skill 7 - Store a PLC Image to an SD Card

Objective 15 - Describe the Conditions for Loading a PLC Image from an SD Card to PLC Memory

Objective 16 - Describe How to Load a User Initiated PLC Image from an SD Card to PLC Memory
Skill 8 - Load a User Initiated PLC Image from an SD Card to PLC Memory
Objective 17 - Describe the Purpose of an Energy Storage Module (ESM) and Give Three Types
Objective 18 - Describe How to Remove and Install an ESM
Skill 9 - Remove and Install an ESM
Self Review 4

2. Basic PLC Programming

Segment 1 - PLC Programming Languages

Objective 1 - Describe Four Languages Used to Program a ControlLogix Processor
Objective 2 - Describe the Function of a Tag
Objective 3 - Describe the Function of Module Defined Tag Structures and Give an Application
Objective 4 - Describe How PLC Module Terminals Are Referenced by Tag Names
Objective 5 - Describe the Function and Operation of Input/Output Diagrams
Skill 1 - Operate the Inputs and Outputs of a PLC
Self Review 1

Segment 2 - PLC Program Instructions

Objective 6 - Describe the Operation of XIC and XIO Input Instructions
Objective 7 - Describe the Operation of an OTE Instruction
Skill 2 - Run a PLC Project That Uses Input and Output Instructions
Objective 8 - Describe the Basic Operation of PLC Ladder Logic
Skill 3 - Run a PLC Project That Uses Basic PLC Logic Elements
Self Review 2

Segment 3 - Latch and Unlatch Instruction

Objective 9 - Describe the Function of the OTL and OTU Instructions and Give an Example
Objective 10 - Describe the Operation of the OTL and OTU Instructions
Skill 4 - Operate a PLC Program That Uses the OTL and OTU Instructions
Self Review 3

Segment 4 - Controller Memory Organization

Objective 11 - Describe the Memory Organization of the ControlLogix
Objective 12 - Describe the Function of a Boolean Tag
Skill 5 - Monitor the Status of ControlLogix Boolean Tags
Self Review 4

Segment 5 - Project Creation and Organization

Objective 13 - Describe the Function of a ControlLogix Project
Objective 14 - Describe How to Create a ControlLogix Project
Skill 6 - Create a ControlLogix Project
Objective 15 - Describe How I/O Modules Communicate with the PLC Processor
Objective 16 - Describe the Function of I/O Configuration
Objective 17 - Describe How to Configure a Discrete I/O Module in a ControlLogix Project
Skill 7 - Configure the I/O of a ControlLogix PLC
Self Review 5

Segment 6 - Programming Software

Objective 18 - Describe the Function of a Routine and List Two Types
Objective 19 - Describe the Function of the Ladder Editor Window and Its Components
Skill 8 - Enter and Run a Basic Routine Using Studio 5000 Software
Self Review 6

3. PLC Motor Control

Segment 1 - Numbering Systems

Objective 1 - List Five Types of Numbering Systems and Explain Their Importance to PLCs
Objective 2 - Describe the Operation of the Decimal Numbering System and Give an Application
Objective 3 - Describe the Operation of the Binary Numbering System and Give an Application
Skill 1 - Convert between Decimal and Binary
Self Review 1

Segment 2 - PLC Program Analysis

Objective 4 - Describe How an Input Device Can Reference Multiple Input Instructions

Objective 5 - Describe How Input Device Logic Affects Input Instruction Logic

Objective 6 - Describe How a PLC Controls Multiple Outputs at the Same Time

Activity 1 - Control of Multiple Outputs

Self Review 2

Segment 3 - Motor Control Basics

Objective 7 - Describe Two Methods by Which a PLC Output Can Control a Motor

Objective 8 - Describe How to Draw a PLC Output Diagram for a Motor Application

Objective 9 - Describe How Input Instructions Can Be Controlled by PLC Output Instructions

Activity 2 - Operation of Input Instructions Controlled by Output Instructions

Skill 2 - Design a PLC Program to Jog a Motor

Self Review 3

Segment 4 - Seal-In Program Logic

Objective 10 - Describe the Function and Operation of PLC Seal-In Logic

Activity 3 - Operation of a Seal-In Motor Control Program

Skill 3 - Design a PLC Program to Control the Start/Stop of a Bidirectional Motor

Self Review 4

Segment 5 - Data Types and User Defined Tags

Objective 11 - Describe the Function of an Internal Output Instruction and Give an Application

Objective 12 - Define Data Type and Describe Three Types

Objective 13 - Describe the Function of Five Pre-Defined Data Types and Give an Application of Each

Objective 14 - Describe How to Create a Tag

Objective 15 - Describe the Function of an Array and Give an Application

Skill 4 - Create a BOOL Tag/Array for a ControlLogix Project

Self Review 5

Segment 6 - Interlock Functions

Objective 16 - Describe the Function and Operation of a Program Interlock and Give an Application

Activity 4 - Operation of a Reversing Motor Control Program with Interlocks

Skill 5 - Design a PLC Program to Interlock Two Motors

Objective 17 - Describe How a Program Interlock Is Used for Safety

Skill 6 - Design a PLC Program That Uses a Safety Interlock to Control the Operation of a Machine

Self Review 6

4. Discrete I/O Interfacing**Segment 1 - Basic Input Interfacing**

Objective 1 - Describe Four Features Used to Select a PLC Discrete Input Module

Activity 1 - 89-DWS Discrete Wiring Station Familiarization

Skill 1 - Connect and Test a Limit Switch to a Discrete Input Module

Self Review 1

Segment 2 - Basic Output Interfacing

Objective 2 - Describe Five Features Used to Select a PLC Discrete Output Module

Skill 2 - Connect and Test the Operation of a Solenoid Valve to a PLC Output

Skill 3 - Connect and Test the Operation of a Motor Starter to a PLC Output

Objective 3 - Describe the Effect of Inductive Loads on Relay Output Modules

Self Review 2

Segment 3 - Electronic Device Interfacing

Objective 4 - Explain How to Interface to a Discrete Electronic Sensor with NPN or PNP Output

Skill 4 - Connect and Test the Operation of an Electronic Sensor to a PLC Input Module

Objective 5 - Describe How to Interface a PLC to a Machine Controller

Skill 5 - Develop an Interface Wiring Diagram to Interface a PLC to a Machine Controller

Skill 6 - Connect and Operate a Conveyor System Using Discrete Inputs and Outputs

Self Review 3

5. PLC Timer Instructions

Segment 1 - Retentive Timer Instructions

Objective 1 - Describe the Function of Two Types of ControlLogix Timer Instructions and Give an Application of Each

Objective 2 - Describe the Operation of a ControlLogix Retentive Timer On Instruction

Skill 1 - Enter and Edit a PLC Program That Uses an RTO Instruction

Self Review 1

Segment 2 - Non-Retentive Timer Instructions

Objective 3 - Describe the Function and Application of Two Types of Non-Retentive Timer Instructions

Objective 4 - Describe the Operation of the Non-Retentive Timer On-Delay Instruction

Skill 2 - Enter and Edit a PLC Program That Uses a TON Instruction

Objective 5 - Describe the Operation of a Timer Off-Delay Instruction

Skill 3 - Enter and Edit a PLC Program That Uses a TOF Instruction

Self Review 2

Segment 3 - Time-Driven Sequencing

Objective 6 - Define Time-Driven Sequencing and Give Three Applications

Objective 7 - Describe the Operation of a Time-Driven Sequence Program

Activity 1 - Operation of a Time-Driven Sequence Program

Skill 4 - Design a PLC Program That Provides Low Voltage Starting of an Electric Motor

Skill 5 - Design a PLC Program That Controls a Centrifugal Air Compressor

Self Review 3

6. PLC Counter Instructions

Segment 1 - Count Up Instruction

Objective 1 - Describe the Functions of Two Types of PLC Counter Instructions

Objective 2 - Describe the Operation of a Count Up Instruction

Skill 1 - Enter and Edit a PLC Program That Uses a Count Up Instruction

Skill 2 - Design a PLC Program to Indicate When Preventive Maintenance Should Be Performed

Self Review 1

Segment 2 - Count Down Instruction

Objective 3 - Describe the Operation of a Count Down Instruction

Skill 3 - Enter and Edit a PLC Program That Uses an Up/Down Counter Instruction

Self Review 2

Segment 3 - BCD Thumbwheel Switches

Objective 4 - Describe the Operation of the BCD Numbering System and Give an Application

Objective 5 - Describe the Function of a BCD Thumbwheel Switch and Give an Application

Objective 6 - Describe the Operation of a BCD Thumbwheel Switch

Objective 7 - Describe the Function and Operation of the FRD Instruction

Skill 4 - Enter a PLC Program That Uses a FRD Instruction

Self Review 3

Segment 4 - LED Displays

Objective 8 - Describe the Function of an LED Display and Give an Application

Objective 9 - Describe the Operation of an LED Display

Objective 10 - Describe the Function and Operation of the TOD Instruction

Skill 5 - Enter and Edit a PLC Program That Uses a TOD Instruction

Skill 6 - Design a PLC Program That Controls an Adjustable Counting Station

Self Review 4

7. Introduction to PLC Troubleshooting

Segment 1 - PLC Troubleshooting

Objective 1 - Describe Two Levels of Troubleshooting and Give an Application of Each

Objective 2 - Describe Seven Types of PLC Faults

Objective 3 - Describe the Functions of PLC Status and Diagnostic Indicators

Skill 1 - Use PLC Status Indicators to Determine the Status of PLC Operation

Self Review 1

Segment 2 - Power Supply Troubleshooting

Objective 4 - Describe the Operation of a PLC Power Distribution System

Objective 5 - Describe How to Troubleshoot a PLC Power Distribution System

Objective 6 - Describe How to Troubleshoot a PLC Chassis Power Supply

Skill 2 - Troubleshoot PLC Power Supply Problems

Self Review 2

Segment 3 - Input Troubleshooting

Objective 7 - Describe How to Test PLC Discrete Input Devices

Skill 3 - Test a PLC Discrete Input Device

Objective 8 - Describe the Operation of the Test Mode and Give an Application

Objective 9 - Describe How to Test a PLC Discrete Input Module

Skill 4 - Test a Discrete Input Module

Self Review 3

Segment 4 - Output Troubleshooting

Objective 10 - Describe the Force Function and Give an Application

Objective 11 - Describe How to Force a Controller Input or Output

Skill 5 - Use the Force Function to Force an Input or Output

Objective 12 - Describe How to Test a PLC Discrete Output Device

Skill 6 - Use the Force Function to Test a PLC Discrete Output Device

Objective 13 - Describe How to Test a PLC Discrete Output Module

Skill 7 - Test a PLC Discrete Output Module

Self Review 4

8. PLC Systems Troubleshooting**Segment 1 - Processor Troubleshooting**

Objective 1 - Describe the Function of Objects and Give an Application

Objective 2 - Describe the Construction of a Controller Object

Objective 3 - Describe the Function of the SSV and GSV Instructions and Give an Application

Objective 4 - Describe the Operation of the GSV Instruction

Skill 1 - Enter a Controller Routine That Uses GSV Instructions to Extract Controller Object Data

Objective 5 - Describe the L7x Controller Status Display and the Fault Codes It Indicates

Objective 6 - Describe How to Troubleshoot a ControlLogix Processor

Objective 7 - Describe the Function of the Controller Properties Dialog

Objective 8 - Describe How to Identify and Manually Clear a Fault Using the Controller Properties Dialog

Skill 2 - Troubleshoot a Processor Fault

Self Review 1

Segment 2 - Systems Troubleshooting Techniques

Objective 9 - Describe Five Methods of PLC Troubleshooting and Give an Application of Each

Objective 10 - Describe Four Types of PLC Component Tests

Objective 11 - Describe a Six-Step PLC Troubleshooting Sequence

Skill 3 - Use a Six-Step Sequence to Troubleshoot a PLC System

Skill 4 - Troubleshoot a PLC-Controlled Electric Motor System

Self Review 2

Segment 3 - Program Documentation

Objective 12 - Describe the Function of Project Documentation and Give an Application

Skill 5 - View Project Documentation and Use It to Operate a PLC Project

Skill 6 - Document a PLC Program File

Self Review 3

9. Event Sequencing**Segment 1 - Introduction to Event Sequencing**

Objective 1 - Define Event-Driven Sequencing

Objective 2 - Describe the Operation of a Reciprocating Actuator PLC Program

Activity 1 - Operation of a Single-Cycle Actuator Reciprocation PLC Program

Skill 1 - Design a Reciprocating Actuator Sequence PLC Program

Self Review 1

Segment 2 - Continuous Cycle Logic

Objective 3 - Describe the Operation of a Continuous Cycle Reciprocating Program

Activity 2 - Operation of a Continuous Cycle Actuator Reciprocating Program

Self Review 2

Segment 3 - Multiple Actuator Event Sequencing

Objective 4 - Describe the Operation of a Basic Multiple Actuator Sequence Program

Activity 3 - Operation of a Clamp and Drill Sequence

Skill 2 - Design a Continuous Cycle Clamp and Drill Sequence PLC Program

Skill 3 - Troubleshoot a Clamp and Drill Sequence PLC Program

Self Review 3

10. Application Development

Segment 1 - Program Development

Objective 1 - Describe the Seven Steps Used to Design a Controller Program

Skill 1 - Design a PLC Program Using a Seven-Step Design Process

Self Review 1

Segment 2 - Modes of Operation

Objective 2 - Describe the Operation of a PLC Program with Manual and Automatic Modes

Activity 1 - Operation of Manual/Automatic Modes

Skill 2 - Troubleshoot a PLC Program with Manual and Automatic Modes

Skill 3 - Design a Motor Control Program That Uses Both Manual and Automatic Modes

Self Review 2

Segment 3 - Stop Functions

Objective 3 - Describe Three Methods of Stopping a PLC-Controlled Machine

Skill 4 - Design a PLC Program That Has Both Halt and Cycle-Stop Functions

Skill 5 - Troubleshoot a PLC Program That Has Both Halt and Cycle-Stop Functions

Self Review 3

Segment 4 - Timer and Counter Applications

Objective 4 - Describe the Application of Timers and Counters in Industrial Control

Skill 6 - Design a PLC Program to Control the Number of Production Cycles

Skill 7 - Design a PLC Program to Control a Plastic Injection Molding Machine

Skill 8 - Troubleshoot a PLC Program That Controls a Plastic Injection Molding Machine

Self Review 4

11. Program Control Instructions

Segment 1 - Program Initialization

Objective 1 - Describe the Function of Controller Status Flags and Give an Application

Objective 2 - Describe the Operation of the Controller Status Flags: First Scan and Minor Fault

Skill 1 - Enter and Edit a PLC Program That Uses the First Scan Flag to Initialize a Program

Self Review 1

Segment 2 - Master Control Reset

Objective 3 - Describe the Function of a Program Control Instruction

Objective 4 - Describe the Function of the MCR Instruction and Give an Application

Objective 5 - Describe the Operation of the MCR Instruction

Skill 2 - Enter a PLC Program That Uses the MCR Instruction

Objective 6 - Describe How a MCR Instruction Can Be Used to Initialize a PLC Program

Skill 3 - Design a PLC Program That Uses an MCR Instruction to Initialize a PLC Program

Self Review 2

Segment 3 - Subroutines

Objective 7 - Describe the Function of a Routine and Give an Application

Objective 8 - Describe the Operation of the JSR Instruction

Skill 4 - Enter and Edit a PLC Program That Uses the JSR Instruction

Skill 5 - Design a PLC Program That Uses Subroutines to Control a Motor Application with an Alarm

Skill 6 - Troubleshoot a PLC Program That Controls a Motor Application with an Alarm

Self Review 3

Segment 4 - Jump and Label Instructions

Objective 9 - Describe the Function of the JMP and LBL Instructions

Objective 10 - Describe the Operation of the JMP and LBL Instructions

Skill 7 - Enter a PLC Program That Uses the JMP and LBL Instructions

Self Review 4

12. Math and Date Move Instructions

Segment 1 - Add Instruction

Objective 1 - Describe Four Types of Tags for Storing Numeric Data and Give an Application

Objective 2 - Describe the Function of Controller Math Instructions and Give an Application

Objective 3 - Describe the Operation of the ADD Instruction

Skill 1 - Enter and Edit a PLC Program That Uses the ADD Instruction

Self Review 1

Segment 2 - Subtract Instruction

Objective 4 - Describe the Operation of the SUB Instruction

Skill 2 - Enter and Edit a PLC Program That Uses the SUB Instruction

Skill 3 - Design a PLC Program That Uses ADD and SUB Instructions to Keep Track of Production

Skill 4 - Design a Program That Uses an LED Display to Show the Results of PLC Math Instructions

Self Review 2

Segment 3 - Multiply and Divide Instructions

Objective 5 - Describe the Operation of the MUL Instruction

Skill 5 - Enter and Edit a PLC Program That Uses the MUL Instruction

Objective 6 - Describe the Operation of the DIV Instruction

Skill 6 - Enter and Edit a PLC Program That Uses the DIV Instruction

Skill 7 - Design a PLC Program That Calculates Production Rate and Unit Time

Self Review 3

Segment 4 - Move Instructions

Objective 7 - Describe the Function of Data Transfer Instructions and Give an Application

Objective 8 - Describe the Operation of the MOV Instruction

Skill 8 - Enter and Edit a PLC Program That Uses a MOV Instruction

Objective 9 - Describe the Function of a Programmable Message Display and Give an Application

Objective 10 - Describe the Operation of a Programmable Message Display

Objective 11 - Describe How to Program a PLC to Display a Message from a Programmable Message Display

Activity 1 - Operation of a Data Display

Skill 9 - Design a PLC Program That Displays Messages about the Status of a Process

Self Review 4



Intermediate PLC Programming

This intermediate course covers ControlLogix PLC operation and basic program instructions, PLC project elements, PLC motor control, PLC event sequencing, counter and timer instructions, PLC ethernet operation, HMI Ethernet operation and component and system troubleshooting. This course also teaches a wide variety of program commands, ranging from analog input and output, 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.

Outline

1. Programmable Controller Operation

Objective 1 - Describe the Function of a Programmable Logic Controller
Objective 2 - Describe the Basic Components of a PLC
Skill 1 - Identify the Components of a Rockwell CompactLogix PLC
Objective 3 - Describe the Types of PLC Programming Languages
Objective 4 - Describe the Basic Structure of a PLC Ladder Logic Program
Objective 5 - Describe the Basic Operation of a PLC
Objective 6 - Describe the Basic Components of Rockwell Studio 5000 PLC Software
Objective 7 - Describe How to Power Up a Rockwell CompactLogix PLC
Skill 2 - Power Up a Rockwell CompactLogix PLC
Self Review 1

2. PLC Project Elements

Objective 1 - Describe the Studio 5000 CompactLogix Tag System
Objective 2 - Describe How to Create a Rockwell Studio 5000 PLC Project
Skill 1 - Create a Rockwell Studio 5000 PLC Project
Objective 3 - Describe How to Enter a PLC Program
Skill 2 - Enter a Rockwell Studio 5000 PLC Logic Program
Objective 4 - Describe How to Edit a Rockwell Studio 5000 PLC Logic Program
Skill 3 - Edit a Rockwell Studio 5000 PLC Logic Program
Objective 5 - Describe the Function of Project Documentation and Give an Application
Skill 4 - Document a PLC Program File
Self Review 1

3. Industrial Communications Network

Segment 1 - NETWORK OPERATION

Objective 1 - Describe three levels of industrial networks and give an example of each
Objective 2 - Describe the operation of ControlNet and give an advantage

Segment 2 - INSTALLATION

Objective 3 - Describe the hardware used for a ControlNet network
Objective 4 - Describe how to install a 1756-CNB ControlNet module in a ControlLogix chassis
Skill 1 - Install a 1756-CNB ControlNet module in a ControlLogix chassis

Segment 3 - MODULE CONFIGURATION

Objective 5 - Describe how to add the 1756-CNB ControlNet module to the ControlLogix I/O configuration
Skill 2 - Add a 1756-CNB ControlNet module to the ControlLogix I/O configuration

Segment 4 - ETHERNET/IP CONFIGURATION

Objective 6 - Describe how to configure an EtherNet/IP driver to communicate with ControlNet
Skill 3 - Configure the EtherNet/IP driver to communicate with ControlNet

4. PLC Ethernet Communication

Objective 1 - Describe the Function of a Point-to-Point Ethernet Network
Objective 2 - Describe the Basic Operation of a Point-to-Point Ethernet Network
Objective 3 - Describe Ethernet Network Addressing
Objective 4 - Describe the Function of RSLinx Software
Objective 5 - Describe How to Configure an RSLinx EtherNet/IP Driver
Skill 1 - Configure an RSLinx EtherNet/IP Driver
Objective 6 - Describe How to Download and Upload a PLC Project
Skill 2 - Use Rockwell Studio 5000 Software to Download and Upload a PLC Project
Objective 7 - Describe How to Use Rockwell Studio 5000 Software to Run and Monitor a PLC
Skill 3 - Use Rockwell Studio 5000 Software to Run and Monitor a PLC Program
Self Review 1

5. Remote I/O

Segment 1 - REMOTE I/O NETWORK OPERATION

Objective 1 - Describe the operation of ControlNet remote I/O and give an advantage
Objective 2 - Describe the operation of connections in a ControlNet remote I/O network
Objective 3 - Describe the relationship between Network Update Time and Requested Packet Interval

Segment 2 - CONFIGURATION

Objective 4 - Describe how to add a child ControlNet module to the ControlLogix I/O configuration
Skill 1 - Configure a 1756-CNB ControlNet module as a child adapter
Skill 2 - Configure a Rack Optimized ControlNet remote I/O network using 1756-CNB modules

Segment 3 - USING RSNETWORX FOR CONTROLNET

Objective 5 - Describe the operation of RSNetWorx for ControlNet
Objective 6 - Describe the menu structure of RSNetWorx for ControlNet
Objective 7 - Describe how to configure a ControlNet network offline using RSNetWorx for ControlNet
Skill 3 - Configure a ControlNet network offline using RSNetWorx for ControlNet
Objective 8 - Describe how to configure a ControlNet network online using RSNetWorx for ControlNet
Skill 4 - Configure a ControlNet network online using RSNetWorx for ControlNet

Segment 4 - REMOTE I/O TAGS

Objective 9 - Describe the tag structure for a ControlNet remote I/O
Skill 5 - Configure a ladder routine that uses ControlNet remote I/O
Skill 6 - Convert a project using local I/O into one using remote I/O

6. Analog Inputs

Segment 1 - Sensors

Objective 1 - Describe the Function of an Analog Sensor and Give an Example
Objective 2 - List Two Types of Analog Signals and Give an Advantage of Each
Objective 3 - Define Eight Terms Used to Describe the Operation of an Analog Sensor
Skill 1 - Calculate Sensor Sensitivity Given Measurement Data
Objective 4 - Describe How to Calculate Process Variables Given Sensitivity, Range, and Output Data
Skill 2 - Calculate Sensor Input Given Sensitivity, Range, and Output Data
Self Review 1

Segment 2 - Analog Input Default Configuration and Operation

Objective 5 - Describe Two Types of Analog Inputs
Objective 6 - Describe the Operation of CompactLogix Modular Analog Inputs
Objective 7 - Describe the Functions of the Six Parameter Groups of a 1734-IE2V Analog Input Module
Objective 8 - Describe How to Default Configure a CompactLogix Analog Input Module
Skill 3 - Default Configure a CompactLogix Expansion Analog Input Module
Self Review 2

Segment 3 - Analog Input Tag Structures and Parameterization

Objective 9 - Describe the Module-Defined Tag Structures of a CompactLogix Analog Input Module
Objective 10 - Describe How to Monitor CompactLogix Analog Module Input Channel Data

Skill 4 - Monitor CompactLogix Analog Input Data

Objective 11 - Describe How to Edit the Configuration of a CompactLogix Analog Input Module

Objective 12 - Describe How to Determine Parameter Settings for a 1734-IE2V Analog Input Module

Skill 5 - Determine and Configure the Parameters for a 1734-IE2V Analog Input Module

Skill 6 - Enter and Operate a PLC Project That Uses Scaled Analog Input Data

Self Review 3

Segment 4 - Comparison Instructions and On/Off Control

Objective 13 - Describe the Operation of CompactLogix Comparison Instructions

Skill 7 - Enter a PLC Program That Uses CompactLogix Comparison Instructions

Objective 14 - Describe the Function of a PLC-Based On/Off Control System That Uses an Analog Input

Skill 8 - Design a PLC Project That Performs On/Off Temperature Control Using an Analog Input

Self Review 4

7. Analog Outputs

Segment 1 - Analog Output Devices

Objective 1 - Describe the Function of an Output Transducer and Give an Application

Objective 2 - List Two Types of Analog Output Signals and Give an Example of Each

Objective 3 - Describe How to Calculate Output Transducer Sensitivity and Explain Its Importance

Skill 1 - Calculate Output Transducer Sensitivity Given Measurement Data

Objective 4 - Describe How to Calculate Transducer Output Given Sensitivity, Range, and Input

Skill 2 - Calculate Transducer Output Given Sensitivity, Range, and Input

Self Review 1

Segment 2 - Analog Output Configuration and Operation

Objective 5 - Describe Two Types of Analog Outputs

Objective 6 - Describe the Operation of the 1734 Analog Output Module

Objective 7 - Describe the Functions of the Seven Parameter Groups of a 1734-OE2V Analog Output Module

Objective 8 - Describe How to Determine Parameter Settings for a 1734-OE2V Analog Output Module

Objective 9 - Describe How to Configure a CompactLogix Analog Output Module

Skill 3 - Configure a CompactLogix 1734-OE2V Analog Output Module

Self Review 2

Segment 3 - Analog Output Tags and Data

Objective 10 - Describe the Module-Defined Tag Structures of a CompactLogix Analog Output Module

Objective 11 - Describe How to Monitor CompactLogix Analog Output Module Channel Data

Skill 4 - Monitor CompactLogix Analog Output Data

Self Review 3

Segment 4 - Variable Speed Drives

Objective 12 - Describe the Operation of a PLC-Controlled Variable Speed Drive

Objective 13 - Describe the Operation of a PLC Project That Uses an Analog Output to Control Motor Speed

Skill 5 - Operate a PLC Project That Uses an Analog Output to Control Motor Speed

Skill 6 - Design a PLC Project That Uses an Analog Output to Control Motor Speed

Self Review 4

8. Variable Output Applications

Segment 1 - PWM Temperature Control

Objective 1 - Describe the Operation of a PLC-Controlled PWM Temperature System

Objective 2 - Describe the Function of Add-On Instructions and Give an Application

Objective 3 - Describe the Operation of the PWM_Out Instruction

Skill 1 - Enter and Operate a Program That Uses the PWM_Out Instruction

Self Review 1

Segment 2 - Stepper Motors

Objective 4 - Describe the Operation of a Stepper Motor System

Objective 5 - Describe the Limits in a Stepper Motor System

Objective 6 - Describe the Function of Homing in a Stepper Motor System

Objective 7 - Describe Three Methods of Homing a Stepper Motor System

Objective 8 - Describe the Operation of the Stepper_Control Instruction

Skill 2 - Enter a PLC Program to Jog and Home a Stepper Motor System

Self Review 2

Segment 3 - Absolute and Relative Modes

Objective 9 - Describe How to Perform Absolute and Relative Moves Using a Stepper Motor

Skill 3 - Enter a PLC Program to Perform Absolute and Relative Moves Using a Stepper Motor

Self Review 3

9. PLC Motion Control

Segment 1 - MOTION CONTROL PROJECT CONFIGURATION

Objective 1 - Describe the function of a motion control system

Objective 2 - Describe the operation of an S7-1200 motion control system

Objective 3 - Describe the operation of an S7-1200 PTO output

Objective 4 - Describe how to create and configure an S7-1200 motion control axis

Skill 1 - Create and configure an S7-1200 motion control axis

Segment 2 - MOTION CONTROL HOMING AND COMMISSIONING

Objective 5 - Describe the function of limits in a motion control system

Objective 6 - Describe the function of homing in a motion control system

Objective 7 - Describe three methods of homing a motion control system

Objective 8 - Describe the function of the extended parameters of an S7-1200 motion control axis

Objective 9 - Describe how to configure the extended parameters of an S7-1200 motion control axis

Skill 2 - Configure the extended parameters of an S7-1200 motion control axis

Objective 10 - Describe how to commission an S7-1200 motion control axis

Skill 3 - Commission an S7-1200 motion control axis

Segment 3 - PLCOPEN MOTION CONTROL FUNCTION BLOCK PROGRAMMING

Objective 11 - Describe the function of the PLCOpen motion control function blocks

Objective 12 - Describe the PLCOpen function blocks required to enable and home an axis

Objective 13 - Describe how to program a PLCOpen function block

Skill 4 - Program a motion control system to enable and home an axis

Objective 14 - Describe the operation of the PLCOpen function blocks required for constant velocity motion

Skill 5 - Program a motion control system to move an axis at a constant velocity

Segment 4 - STEPPER MOTOR POSITION CONTROL

Objective 15 - Describe the operation of the PLCOpen position control function blocks

Skill 6 - Enter a motion control project to control the position of a stepper motor

Objective 16 - Describe the operation of the MC_CommandTable function block

Skill 7 - Enter a motion control project that uses the MC_CommandTable function block

10. PLC Event Sequencing 2

Objective 1 - Describe How to Design a PLC Sequence Program Using a Seven-Step Process

Objective 2 - Describe the Operation of a Basic Multiple Actuator PLC Sequence Program

Skill 1 - Enter and Operate a Multiple Actuator PLC Sequence Program

Skill 2 - Design a Multiple Actuator PLC Sequence Program Using a Seven-Step Design Process

Objective 3 - Define Time-Driven Sequencing and Give an Application

Objective 4 - Describe the Operation of a Time-Driven Sequence PLC Program

Skill 3 - Enter and Operate a Time-Driven Sequence PLC Program

Objective 5 - Describe the Operation of a PLC Program Safety Interlock

Skill 4 - Enter and Operate a PLC Program That Uses a Safety Interlock

Self Review 1

11. Produced/Consumed Data and Messages

Segment 1 - DATA TRANSFERS BETWEEN CONTROLLERS

Objective 1 - Describe two types of data transferred between controllers

Objective 2 - Describe the function of a User-Defined data type

Objective 3 - Describe how to create a User-Defined data type

Skill 1 - Create a User-Defined data type in a ControlLogix project

Segment 2 - PRODUCED AND CONSUMED DATA

Objective 4 - Describe the Allen-Bradley Producer/Consumer model for industrial networks

Objective 5 - Describe how to configure controllers to produce and consume data
Skill 2 - Configure a ControlLogix project I/O folder to produce and consume data using ControlNet
Objective 6 - Describe how to create produced and consumed tags in a ControlLogix project
Skill 3 - Create produced and consumed tags in ControlLogix projects
Skill 4 - Transfer data between controllers using produced and consumed tags on ControlNet

Segment 3 - USING THE MESSAGE INSTRUCTION

Objective 7 - Describe the operation of the Message instruction
Objective 8 - Describe how to configure the Message instruction
Skill 5 - Configure a MSG instruction to transfer data between ControlLogix controllers

Segment 4 - TROUBLESHOOTING

Objective 9 - Describe three common symptoms of an ControlNet Network failure
Objective 10 - Describe four causes of faults in a ControlNet network
Objective 11 - Describe how to troubleshoot ControlNet cable failures
Skill 6 - Test a ControlNet cable and terminator for failures
Objective 12 - Describe how to troubleshoot 1756-CNB ControlNet modules
Skill 7 - Troubleshoot the 1756-CNB ControlNet module

Segment 5 - TROUBLESHOOTING CONTROLNET NETWORKS

Objective 13 - Describe how to troubleshoot a ControlNet network
Skill 8 - Troubleshoot ControlNet network faults

Segment 6 - TROUBLESHOOTING THE MSG INSTRUCTION

Objective 14 - Describe how to troubleshoot the MSG instruction
Skill 9 - Troubleshoot the MSG instruction

12. Introduction to AC Variable Frequency Drives

Segment 1 - Variable Speed AC Drive Basics

Objective 1 - Describe the Function and Operation of Two Common Types of Variable Speed AC Drives
Objective 2 - Describe the Advantages and Disadvantages of Using an AC Drive Instead of a DC Drive
Objective 3 - Describe the Advantages of Starting a Motor with an AC Drive Instead of Line Starting
Skill 1 - Operate a Motor Using the Program Keypad of a Variable Frequency Drive
Self Review 1

Segment 2 - Two and 3-Wire Control

Objective 4 - Describe the External Control Capabilities of a Variable Frequency AC Drive
Skill 2 - Program and Connect a Variable Frequency AC Drive for 3-Wire Control
Skill 3 - Operate a 3-Wire Control Circuit Using a Variable Frequency AC Drive
Skill 4 - Program and Operate a 2-Wire Control Circuit Using a Variable Frequency Drive
Self Review 2

Segment 3 - Jogging Control

Objective 5 - Describe How Motor Jogging Is Accomplished with a Variable Frequency AC Drive
Skill 5 - Program, Connect, and Operate a Variable Frequency AC Drive for Motor Jogging
Self Review 3

13. Speed and Torque Control

Segment 1 - Basic Speed Control

Objective 1 - Describe How Frequency Affects the Speed on an AC Induction Motor
Objective 2 - Describe the Output of a Variable Frequency Drive
Activity 1 - Output Characteristics of a Variable Speed AC Drive
Objective 3 - Define Reflected Wave Voltage and Describe Its Effect on an AC Induction Motor
Objective 4 - Describe Three Steps That Can Be Taken to Reduce the Effects of Reflected Wave Voltage
Skill 1 - Control Motor Speed Using the Keypad of a Variable Frequency AC Drive
Skill 2 - Connect and Operate a Circuit to Control Motor Speed Using a Variable Frequency AC Drive
Self Review 1

Segment 2 - Advanced Speed Control

Objective 5 - Describe How to Program a Variable Frequency AC Drive for Multiple Speed Selections
Objective 6 - Describe How to Program a Variable Frequency AC Drive to Skip Frequencies
Skill 3 - Program and Operate a Variable Frequency AC Drive Using Preset Speeds

Objective 7 - Describe How to Program a Variable Frequency AC Drive to Drive a Motor above Its Base Speed

Skill 4 - Program and Operate a Variable Frequency AC Drive to Drive a Motor above Its Base Speed

Self Review 2

Segment 3 - Torque Control

Objective 8 - Define Volts per Hertz Ratio

Objective 9 - Explain How the Volts per Hertz Ratio Affects the Torque Capabilities of a Motor

Skill 5 - Calculate Volts per Hertz Ratio

Skill 6 - Program and Operate a Variable Frequency AC Drive to Provide Low Speed Boost

Self Review 3

14. Acceleration/Deceleration and Braking

Segment 1 - Ramping

Objective 1 - Define Ramping and Explain Its Importance

Objective 2 - Explain How Ramping Is Accomplished Using a Variable Frequency AC Drive

Skill 1 - Program and Operate a Variable Frequency AC Drive to Ramp a Motor to Its Rated Speed

Skill 2 - Program and Operate a Variable Frequency AC Drive to Ramp a Motor to a Stop

Self Review 1

Segment 2 - Special Acceleration Methods

Objective 3 - Describe How a Variable Frequency AC Drive Can Accelerate a Motor past Its Rated Speed

Skill 3 - Program and Operate a Variable Frequency AC Drive to Ramp an AC Motor past Its Rated Speed

Objective 4 - Describe S-Curve Acceleration and Explain How It Is Used

Skill 4 - Program and Operate a Variable Frequency AC Drive to Provide S-Curve Acceleration

Self Review 2

Segment 3 - Braking

Objective 5 - Describe DC Injection Braking Using a Variable Frequency AC Drive and Give an Application

Skill 5 - Program and Operate a Variable Frequency AC Drive to Provide DC Injection Braking to a Motor

Self Review 3

15. HMI Ethernet Operation

Objective 1 - Describe the Function of an HMI Panel

Objective 2 - Describe the Parts of an HMI Panel

Objective 3 - Describe How to Connect an HMI Panel in an Ethernet Network

Skill 1 - Connect an HMI Panel in an Ethernet Network

Objective 4 - Describe How to Configure the IP Address on an HMI Panel

Skill 2 - Configure an HMI Panel for an Ethernet Network

Objective 5 - Describe How to Download a Project to an HMI Panel

Skill 3 - Download an HMI Project to an HMI Panel

Objective 6 - Describe the Basic Operation of an HMI Panel

Objective 7 - Describe How to Operate a PLC Project that Uses an HMI Panel

Skill 4 - Operate a PLC Project that Uses an HMI Panel

Self Review 1

16. Basic Panel View Plus Terminal Operation

Segment 1 - PanelView Plus Terminal-PLC Connections

Objective 1 - Describe the Components of a PanelView Plus Terminal

Objective 2 - Describe How to Configure the IP Address of a PanelView Plus Terminal

Objective 3 - Describe How to Connect a PanelView Plus Terminal to an Ethernet Network

Skill 1 - Configure the IP Address of a PanelView Plus Terminal

Self Review 1

Segment 2 - PanelView Plus Terminal Projects

Objective 4 - Describe the Basic Operation of a PanelView Plus Terminal

Objective 5 - Describe How to Transfer an Application Using FactoryTalk View Studio Software

Skill 2 - Transfer an Application Using FactoryTalk View Studio Software

Self Review 2

Segment 3 - PanelView Plus Terminal Operation

Objective 6 - Describe Two Classifications of Graphic Objects
Objective 7 - Describe the Functions of Seven Types of Input Objects
Objective 8 - Describe the Functions of Three Types of Output Objects
Objective 9 - Describe How to Operate a PanelView Plus Terminal
Skill 3 - Operate a PanelView Plus Terminal
Self Review 3

17. PanelView Plus Application Editing

Segment 1 - FactoryTalk View Studio - Machine Edition

Objective 1 - Describe the Function of FactoryTalk View Studio-Machine Edition Software
Objective 2 - Describe the Menu Structure of Studio-ME Software
Objective 3 - Describe the Components of a Studio-ME Application
Skill 1 - Identify FactoryTalk View Studio Software Components
Objective 4 - Describe the Function of FactoryTalk View Station Software
Self Review 1

Segment 2 - Tags and Communication

Objective 5 - Describe the Function of Tags in a FactoryTalk View Studio-Machine Edition Application
Objective 6 - Describe the Function of Communication Configuration in a Studio-ME Application
Objective 7 - Describe How to Configure Communications for a Studio-ME Application
Skill 2 - Configure Communications for a Studio-ME Application
Self Review 2

Segment 3 - Application Displays

Objective 8 - Describe How to Create and Configure an Application Display
Objective 9 - Describe How to Create and Configure a Text Object
Skill 3 - Create and Configure an Application Display with Text Objects
Objective 10 - Describe How to Create and Configure a Display List Selector Object
Skill 4 - Create and Configure a Display List Selector Object
Self Review 3

Segment 4 - Input and Output Objects

Objective 11 - Describe How to Create and Configure a Dynamic Object
Objective 12 - Describe the Operation of Six Pushbutton Objects
Skill 5 - Create and Configure a Pushbutton Object
Objective 13 - Describe the Operation of a Multistate Indicator Object
Skill 6 - Create and Configure a Multistate Indicator Object
Self Review 4

18. PanelView Plus Application Editing 2

Segment 1 - Numeric Input/Output

Objective 1 - Describe the Function of a Numeric Input Object
Objective 2 - Describe How to Configure a Numeric Input Object
Skill 1 - Create and Configure a Numeric Input Object
Objective 3 - Describe the Function of a Numeric Output Object
Objective 4 - Describe How to Configure a Numeric Output Object
Skill 2 - Create and Configure a Numeric Output Object
Self Review 1

Segment 2 - Editing Studio-ME Displays

Objective 5 - Describe How to Perform Basic Editing of Objects and Displays
Skill 3 - Edit a Studio-ME Display
Self Review 2

Segment 3 - Local Messages

Objective 6 - Describe the Function of Local Message Display Objects
Objective 7 - Describe How to Create and Configure a Local Message Display Object
Skill 4 - Create and Configure a Local Message Display Object
Self Review 3

Segment 4 - Alarms and Diagnostic Messages

Objective 8 - Describe the Three Types of Warning Messages and Give an Example of Each Type

Objective 9 - Describe the Operation of Alarm Messages

Objective 10 - Describe How to Create and Configure Alarms

Skill 5 - Create and Configure Alarms for a PanelView Plus Application

Objective 11 - Describe the Operation of Diagnostic Messages

Objective 12 - Describe How to Configure Diagnostic Messages

Objective 13 - Describe How to Configure the Diagnostic Setup

Skill 6 - Configure Diagnostic Messages for a PanelView Plus Application

Self Review 4

Segment 5 - Information Messages

Objective 14 - Describe the Operation of Information Messages

Objective 15 - Describe How to Configure Information Messages

Skill 7 - Create and Configure Information Messages for a PanelView Plus Application

Self Review 5

19. Component Troubleshooting

Objective 1 - Describe Two Levels of Troubleshooting and Give an Application of Each

Objective 2 - Describe Six Types of PLC Faults

Objective 3 - Describe the Operation of a PLC Power Distribution System

Objective 4 - Describe How to Use the PLC's Status and Diagnostic Indicators to Troubleshoot a PLC

Skill 1 - Use Status and Diagnostic Indicators to Troubleshoot a PLC

Objective 5 - Describe How to Troubleshoot PLC Discrete Inputs and Input Devices

Skill 2 - Troubleshoot PLC Discrete Inputs and Input Devices

Objective 6 - Describe How to Force on a PLC Output

Skill 3 - Force on a PLC Output

Objective 7 - Describe How to Troubleshoot PLC Discrete Outputs and Output Devices

Skill 4 - Troubleshoot PLC Discrete Outputs and Output Devices

Self Review 1

20. System Troubleshooting

Objective 1 - Describe How to Troubleshoot a PLC Power Distribution System

Skill 1 - Troubleshoot a PLC Power Distribution System

Objective 2 - Describe How to Troubleshoot a CompactLogix Processor

Objective 3 - Describe How to Identify and Clear a PLC Processor Fault

Skill 2 - Troubleshoot and Clear a PLC Processor Fault

Objective 4 - Describe Five Methods of Systems Troubleshooting

Objective 5 - Describe a Six-Step Systems Troubleshooting Process

Skill 3 - Use a Six-Step Systems Process to Troubleshoot a PLC System

Self Review 1