



Western Technical College

## 10620158 PLC Applications

### Course Outcome Summary

#### Course Information

<b>Description</b>	This course will cover fundamental PLC hardware and wiring. This course includes PLC CPU, discrete and analog input/output modules, and circuit wiring with basic industrial control devices hardwired to the PLC modules. Additionally, programming an address-based touch screen and interface it with a PLC will be completed. Interfacing between personal computers, PLCs, and touch screen panels along with drivers, will be applied.
<b>Career Cluster</b>	Manufacturing
<b>Instructional Level</b>	Associate Degree Courses
<b>Total Credits</b>	2
<b>Total Hours</b>	54

#### Textbooks

*Programmable Logic Controllers*. 5th Edition. Copyright 2017. Petruzella, Frank D. Publisher: McGraw-Hill Publishing Company. **ISBN-13:** 978-0-07-337384-3. Required.

#### Learner Supplies

Safety glasses with side eye protection that meet Z87 OSHA guidelines. **Vendor:** Campus Shop. Required.  
Scientific calculator (recommend T1-36x Solar). **Vendor:** Campus Shop. Required.

#### Success Abilities

1. Cultivate Passion: Increase Self-Awareness
2. Live Responsibly: Develop Resilience
3. Live Responsibly: Foster Accountability
4. Refine Professionalism: Act Ethically
5. Refine Professionalism: Improve Critical Thinking

## Program Outcomes

1. Perform work safely.
2. Troubleshoot electrical and mechanical systems and devices.
3. Repair electrical and mechanical systems.
4. Communicate technical information.
5. Integrate electrical and mechanical systems and devices.

## Course Competencies

### 1. Investigate programmable logic controllers (PLC) in hard wired systems.

#### Assessment Strategies

- 1.1. Skill Demonstration
- 1.2. Written Product

#### Criteria

*You will know you are successful when*

- 1.1. you investigate schematic drawings for integration with the PLC.
- 1.2. you identify addressing systems for devices being terminated to the PLC.
- 1.3. you select applicable devices for termination to the PLC.
- 1.4. you select the correct data size for the applicable device.

#### Learning Objectives

- 1.a. Investigate schematic drawings for integration with the PLC.
- 1.b. Identify addressing systems for devices being terminated to the PLC.
- 1.c. Select applicable devices for termination to the PLC.
- 1.d. Select the correct data size for the applicable device.

### 2. Terminate inputs and outputs into a PLC system.

#### Assessment Strategies

- 2.1. Skill Demonstration
- 2.2. Written Product

#### Criteria

*You will know you are successful when*

- 2.1. you terminate with correct wires according to rubric created by instructor.
- 2.2. you strip wires correctly.
- 2.3. you secure wires at termination.
- 2.4. you demonstrate wire management protocols/procedures identified by instructor.

#### Learning Objectives

- 2.a. Terminate with correct wires according to rubric created by instructor.
- 2.b. Strip wires correctly.
- 2.c. Fasten wires at termination.
- 2.d. Demonstrate wire management protocols/procedures identified by instructor.

### 3. Program bit logic as it relates to a discrete hard wired system.

#### Assessment Strategies

- 3.1. Written Objective Test
- 3.2. Written Product

#### Criteria

*You will know you are successful when*

- 3.1. you program XIO and XIC as it pertains to input devices.
- 3.2. you program OTE, OTL and OTU as it pertains to output devices.
- 3.3. you program One Shot as it pertains to input devices.

- 3.4. you program Bit Shift instructions.
- 3.5. you test operation of hard wired system.
- 3.6. you fix any problems identified.

**Learning Objectives**

- 3.a. Program XIO and XIC as it pertains to input devices.
- 3.b. Program OTE, OTL and OTU as it pertains to output devices.
- 3.c. Program One Shot as it pertains to input devices.
- 3.d. Program Bit Shift instructions.
- 3.e. Test operation of hard wired system.
- 3.f. Fix any problems identified.

**4. Program word level logic in a hard wired system.**

**Assessment Strategies**

- 4.1. Skill Demonstration
- 4.2. Written Product

**Criteria**

*You will know you are successful when*

- 4.1. you program the MOV and MVM commands.
- 4.2. you program Subroutines.
- 4.3. you utilize MCR commands.
- 4.4. you program math and comparison instructions.
- 4.5. you utilize the sequencer instruction.
- 4.6. you test operation of word level logic and program and repair any problems.

**Learning Objectives**

- 4.a. Program the MOV and MVM commands.
- 4.b. Program Subroutines.
- 4.c. Utilize MCR commands.
- 4.d. Program math and comparison instructions.
- 4.e. Utilize the sequencer instruction.
- 4.f. Test operation of word level logic and program.

**5. Investigate applicability and function of human machine interface (HMI) systems.**

**Assessment Strategies**

- 5.1. Skill Demonstration
- 5.2. Written Product

**Criteria**

*You will know you are successful when*

- 5.1. you identify the types of HMI systems available.
- 5.2. you investigate function and operation of various HMI systems.
- 5.3. you select HMI for hard wired system.
- 5.4. you identify software for programming the selected HMI.
- 5.5. you identify drivers needed for the selected HMI.

**Learning Objectives**

- 5.a. Identify the types of HMI systems available.
- 5.b. Investigate function and operation of various HMI systems.
- 5.c. Select HMI for hard wired system.
- 5.d. Identify software for programming the selected HMI.
- 5.e. Identify drivers needed for the selected HMI.

**6. Wire communications and power to HMI and applicable devices.**

**Assessment Strategies**

- 6.1. Skill Demonstration
- 6.2. Written Product

**Criteria**

*You will know you are successful when*

- 6.1. you locate correct cables and wires needed.
- 6.2. you connect PC to the HMI.
- 6.3. you connect HMI to the PLC.
- 6.4. you connect the HMI to power.

#### **Learning Objectives**

- 6.a. Locate correct cables and wires needed.
- 6.b. Connect PC to the HMI.
- 6.c. Connect HMI to the PLC.
- 6.d. Connect the HMI to power.

### **7. Configure drivers, programs, and hardware settings for HMI communications.**

#### **Assessment Strategies**

- 7.1. Skill Demonstration
- 7.2. Written Product

#### **Criteria**

*You will know you are successful when*

- 7.1. you set static ethernet address to the PC.
- 7.2. you set static ethernet address to the HMI.
- 7.3. you configure ethernet driver.
- 7.4. you create communication between the PC and the HMI.
- 7.5. you set communication protocols in the HMI to identify the correct PLC.
- 7.6. you test HMI communications and repair any problems found.

#### **Learning Objectives**

- 7.a. Set static ethernet address to the PC.
- 7.b. Set static ethernet address to the HMI.
- 7.c. Configure ethernet driver.
- 7.d. Create communication between the PC and the HMI.
- 7.e. Set communication protocols in the HMI to identify the correct PLC.
- 7.f. Test HMI communications.

### **8. Program HMI for optimal operation.**

#### **Assessment Strategies**

- 8.1. Skill Demonstration
- 8.2. Written Product

#### **Criteria**

*You will know you are successful when*

- 8.1. you apply name and value to tags.
- 8.2. you create applications.
- 8.3. you create screens.
- 8.4. you create navigational, entry, and display objects.
- 8.5. you utilize drawing tools.

#### **Learning Objectives**

- 8.a. Apply name and value to tags.
- 8.b. Create applications.
- 8.c. Create screens.
- 8.d. Create navigational, entry, and display objects.
- 8.e. Utilize drawing tools.