



Western Technical College

## 10620153 Basic PLC Programming with Digital

### Course Outcome Summary

#### Course Information

<b>Description</b>	This course introduces the concepts of digital logic and PLC Ladder Logic Programming. Digital number systems and basic logic gates are covered. Emphasis is placed on providing a foundation for the application of PLC Programming. PLC Ladder Logic programming will also be addressed using simulation software. Basic programming instructions will include bit instructions, timers/counters, and other word based instructions.
<b>Career Cluster</b>	Manufacturing
<b>Instructional Level</b>	Associate Degree Courses
<b>Total Credits</b>	2
<b>Total Hours</b>	54

#### Pre/Corequisites

Pre/Corequisite 10620103 Industrial Electricity

#### 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: Enhance Personal Connections
2. Cultivate Passion: Expand a Growth-Mindset
3. Cultivate Passion: Increase Self-Awareness
4. Live Responsibly: Develop Resilience
5. Live Responsibly: Foster Accountability
6. Refine Professionalism: Act Ethically
7. 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.

#### Assessment Strategies

- 1.1. Written Objective Test
- 1.2. Skill Demonstration

#### Criteria

*You will know you are successful when*

- 1.1. you identify programmable controllers.
- 1.2. you describe principles of operation.
- 1.3. you describe modifying the operation.
- 1.4. you compare PLC's with computers.

#### Learning Objectives

- 1.a. Identify programmable controllers.
- 1.b. Describe principles of operation.
- 1.c. Describe modifying the operation.
- 1.d. Compare PLCs with computers.

### 2. Examine digital number systems.

#### Assessment Strategies

- 2.1. Written Objective Test
- 2.2. Skill Demonstration

#### Criteria

*You will know you are successful when*

- 2.1. you identify number system in use.
- 2.2. you convert numbers to/from binary number system.
- 2.3. you convert numbers to/from hexadecimal number system.
- 2.4. you convert numbers to/from decimal number system.

#### Learning Objectives

- 2.a. Identify number system in use.

- 2.b. Convert numbers to/from binary number system.
- 2.c. Convert numbers to/from hexadecimal number system.
- 2.d. Convert numbers to/from decimal number system.

### **3. Examine bit logic as it relates to software.**

#### **Assessment Strategies**

- 3.1. Written Objective Test
- 3.2. Skill Demonstration

#### **Criteria**

*You will know you are successful when*

- 3.1. you investigate components of bit logic, including but not limited to, XIO, XIC, OTE, OTL, OTU, One Shot.
- 3.2. you compare components of bit logic, including applicability (how and when to use).
- 3.3. you identify bit logic component interaction with hard wired device.

#### **Learning Objectives**

- 3.a. Investigate components of bit logic, including but not limited to, XIO, XIC, OTE, OTL, OTU, One Shot.
- 3.b. Compare components of bit logic, including applicability (how and when to use).
- 3.c. Identify bit logic component interaction with hard wired device.

### **4. Demonstrate bit logic programming as it relates to software.**

#### **Assessment Strategies**

- 4.1. Written Objective Test
- 4.2. Skill Demonstration

#### **Criteria**

*You will know you are successful when:*

- 4.1. you select the correct software for programming the PLC.
- 4.2. you select the correct software for communication with the PLC.
- 4.3. you create the program in the selected software.
- 4.4. you download the program created.
- 4.5. you verify operation of the program.
- 4.6. you troubleshoot potential problems with program, communications, or software and correct.

#### **Learning Objectives**

- 4.a. Choose the correct software for programming the PLC.
- 4.b. Choose the correct software for communication with the PLC.
- 4.c. Produce a program in the selected software.
- 4.d. Apply the program created to the PLC.
- 4.e. Demonstrate operation of the program.
- 4.f. Investigate potential problems with program, communications, or software.

### **5. Demonstrate timer programming as it relates to software.**

#### **Assessment Strategies**

- 5.1. Written Objective Test
- 5.2. Skill Demonstration

#### **Criteria**

*You will know you are successful when*

- 5.1. you select the correct software for programming the PLC.
- 5.2. you select the correct software for communication with the PLC.
- 5.3. you create the program in the selected software.
- 5.4. you download the program created.
- 5.5. you verify operation of the program.
- 5.6. you troubleshoot potential problems with the program, communications, or software and correct.

#### **Learning Objectives**

- 5.a. Choose the correct software for programming the PLC.
- 5.b. Choose the correct software for communication with the PLC.

- 5.c. Produce a program in the selected software.
- 5.d. Apply the program created to the PLC.
- 5.e. Demonstrate operation of the program.
- 5.f. Investigate potential problems with program, communications, or software.

**6. Demonstrate counter programming as it relates to software.**

**Assessment Strategies**

- 6.1. Written Objective Test
- 6.2. Skill Demonstration

**Criteria**

*You will know you are successful when*

- 6.1. you select the correct software for programming the PLC.
- 6.2. you select the correct software for communication with the PLC.
- 6.3. you create the program in the selected software.
- 6.4. you download the program created.
- 6.5. you verify operation of the program.
- 6.6. you troubleshoot potential problems with program, communications, or software and correct.

**Learning Objectives**

- 6.a. Choose the correct software for programming the PLC.
- 6.b. Choose the correct software for communication with the PLC.
- 6.c. Produce a program in the selected software.
- 6.d. Apply the program created to the PLC.
- 6.e. Demonstrate operation of the program.
- 6.f. Investigate potential problems with program, communications, or software.

**7. Manipulate data larger than bit as it relates to software.**

**Assessment Strategies**

- 7.1. Written Objective Test
- 7.2. Skill Demonstration

**Criteria**

*You will know you are successful when*

- 7.1. you select the correct software for programming the PLC.
- 7.2. you select the correct software for communication with the PLC.
- 7.3. you create the program in the selected software.
- 7.4. you download the program created.
- 7.5. you verify operation of the program.
- 7.6. you troubleshoot potential problems with program, communications, or software and correct.

**Learning Objectives**

- 7.a. Choose the correct software for programming the PLC.
- 7.b. Choose the correct software for communication with the PLC.
- 7.c. Produce the program in the selected software.
- 7.d. Apply the program to the PLC.
- 7.e. Demonstrate operation of the program.
- 7.f. Investigate potential problems with program, communications, or software.