Western Technical College

10620114 Siemens Control Systems

Course Outcome Summary

Course Information

Description	This class introduces the parts and operations of Siemens programmable logic controllers (PLCs) and describes the functions and different programming languages you will find on these PLCs. It also covers the methods of communication between hardware components and discusses basic guidelines for PLC installation. An overview of a Siemens HMI device and the system used program and communicate with it by Siemens PLCs will be included. This class also provides an overview of the STEP 7 Basic (TIA Portal) software used to configure and program the PLC as well.
Career Cluster	Manufacturing
Instructional Level	Associate Degree Courses
Total Credits	2
Total Hours	54

Pre/Corequisites

Prerequisite 10620158 PLC Applications

Textbooks

Siemens Step 7 (TIA Portal) Programming: A Practical Approach. 1st Edition. Copyright 2015. Stenerson, Jon and David Deeg. Publisher: CreateSpace Publishing. **ISBN-13**: 978-1-5152-2054-1. Required.

Success Abilities

1. Cultivate Passion: Expand a Growth-Mindset
2. Cultivate Passion: Increase Self-Awareness
3. Live Responsibly: Develop Resilience

4. Live Responsibly: Foster Accountability
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. Commission Siemens programmable logic controllers (PLC) and S7 software.

Assessment Strategies

1.1. Lab
1.2. Skill Demonstration
1.3. Written Exam

Criteria

You will know you are successful when

1.1. you identify and interpret protocols and configurations in Siemens systems.
1.2. you select the correct software.
1.3. you identify the correct PLC.
1.4. you connect cables and wires from PLC to PC and power.
1.5. you set Ethernet addresses.
1.6. you configure Ethernet driver.

Learning Objectives

1.a. Employ Siemens Step7 software to commission a PLC.
1.b. Locate correct cables and wires needed.
1.c. Connect PC to the PLC.
1.d. Connect the PLC to power.
1.e. Set static Ethernet address to the PC.
1.f. Set static Ethernet address to the PLC.
1.g. Configure Ethernet driver.

2. Program a Siemens S7 project using Block based system.

Assessment Strategies

2.1. Lab
2.2. Skill Demonstration
2.3. Written Exam

Criteria

You will know you are successful when

2.1. you define the types of blocks: network, function block, organizational block, data block.
2.2. you create a program using networks and/or programs in a network.
2.3. you create a program using function blocks.
2.4. you explain the relationship between blocks to the organizational blocks.
2.5. you apply blocks to create projects.

Learning Objectives

2.a. Define the types of blocks: network, function block, organizational block, data block.
2.b. Create a program using networks and/or programs in a network.
2.c. Create a program using function blocks.

2.d. Explore how blocks can be used within other blocks.
2.e. Identify the relationship between blocks to the organizational blocks.
2.f. Apply blocks to create projects.

3. Program PLC using bit logic for Siemens S7 software.

Assessment Strategies

3.1. Lab
3.2. Skill Demonstration
3.3. Written Exam

Criteria

You will know you are successful when

3.1. you interpret diagrams/pictures for programming.
3.2. you program logic as it pertains to binary inputs and outputs.
3.3. you identify problems in programming.
3.4. you troubleshoot identified problems.
3.5. you correct problems through programming.

Learning Objectives

3.a. Identify diagrams/pictures for programming.
3.b. Apply prior knowledge regarding common programming language or terminology to Siemens programming objects.
3.c. Program XIO and XIC as it pertains to input devices.
3.d. Program OTE, OTL and OTU as it pertains to output devices.
3.e. Program One Shot objects.
3.f. Program Bit Shift instructions.
3.g. Identify problems.
3.h. Troubleshoot problems.
3.i. Correct problems.

4. Program PLC using multi-bit data for Siemens S7 software.

Assessment Strategies

4.1. Lab
4.2. Skill Demonstration
4.3. Written Exam

Criteria

You will know you are successful when

4.1. you interpret programming functions larger than binary.
4.2. you program timer and counter instructions in S7 software.
4.3. you program the MOV, MVM, and MCR commands.
4.4. you program math, comparison, and sequencer instructions.
4.5. you identify problems in programming.
4.6. you troubleshoot identified problems.
4.7. you correct problems in programming.

Learning Objectives

4.a. Demonstrate timer and counter programming as it relates to S7 software.
4.b. Program the MOV and MVM commands.
4.c. Use MCR commands.
4.d. Program math and comparison instructions.
4.e. Use a sequencer instruction.
4.f. Identify problems.
4.g. Troubleshoot problems.
4.h. Correct problems.

5. Wire digital and analog devices in a Siemens PLC system.

Assessment Strategies

5.1. Lab
5.2. Skill Demonstration

5.3. Written Exam

Criteria

You will know you are successful when

5.1. you identify the termination points and devices from a diagram.
5.2. you terminate wires based on diagram information.
5.3. you strip wires.
5.4. you fasten wires at termination.
5.5. you apply wire management protocols/procedures.

Learning Objectives

5.a. Interpret a diagram to identify where to terminate wires.
5.b. Strip wires correctly.
5.c. Fasten wires at termination.
5.d. Demonstrate wire management protocols/procedures.

6. Commission a human machine interface (HMI) in a Siemens S7 PLC system.

Assessment Strategies

6.1. Lab
6.2. Skill Demonstration
6.3. Written Exam

Criteria

You will know you are successful when

6.1. you install cables and wires to connect switches.
6.2. you set Ethernet addresses for the PLC, PC, and HMI.
6.3. you configure drivers and protocols for communications between HMI, PLC, and PC.
6.4. you identify problems in HMI startup .
6.5. you troubleshoot identified problems.
6.6. you correct problems to use the HMI.

Learning Objectives

6.a. Locate correct cables and wires needed.
6.b. Connect the HMI to the switch.
6.c. Connect the PC to the switch.
6.d. Connect the PLC to the switch.
6.e. Connect the HMI to power.
6.f. Set static ethernet address to the PC.
6.g. Set static ethernet address to the HMI.
6.h. Configure ethernet driver.
6.i. Set communication protocols in the HMI to identify the correct PLC.
6.j. Identify problems.
6.k. Troubleshoot problems.
6.l. Correct problems.

7. Program HMI.

Assessment Strategies

7.1. Lab
7.2. Skill Demonstration
7.3. Written Exam

Criteria

You will know you are successful when

7.1. you create applications for project.
7.2. you create screens through programming.
7.3. you create navigational, entry, and display objects through programming.

Learning Objectives

7.a. Apply name and value to tags.
7.b. Create applications.

7.c. Create screens.
7.d. Create navigational, entry, and display objects.
7.e. Utilize drawing tools.

8. Investigate Siemens based data addressing systems.

Assessment Strategies

8.1. Lab
8.2. Skill Demonstration
8.3. Written Exam

Criteria

You will know you are successful when

8.1. you program using tags in a S7 system.
8.2. you manipulate data in the tags.
8.3. you identify different data sized tags.
8.4. you identify scope of tags.

Learning Objectives

8.a. Apply tags to data in a Siemens system.
8.b. Identify tags on PLCs and modules.
8.c. Create tags in data blocks.
8.d. Explore how data blocks can transfer tags.
8.e. Create the monitor list of tags
8.f. Monitor the list of tags.
8.g. Force binary data into the tags.
8.h. Assign data into the tags.
8.i. Explore scope of tags.

9. Investigate alternative languages in a Siemens PLC system.

Assessment Strategies

9.1. Lab
9.2. Skill Demonstration
9.3. Written Exam

Criteria

You will know you are successful when

9.1. you interpret programming commands in alternative languages.
9.2. you program in Function Block language for Siemens PLC system.
9.3. you program in Statement List language for Siemens PLC system.
9.4. you identify problems in programming.
9.5. you troubleshoot identified problems.
9.6. you correct problems in programming.

Learning Objectives

9.a. Explore Function Block language for Siemens PLC system.
9.b. Explore Statement List language for Siemens PLC system.
9.c. Apply prior knowledge regarding programming terminology to alternative languages.
9.d. Identify problems.
9.e. Troubleshoot problems.
9.f. Correct problems.