ELT 258 Programmable Logic Controllers
Programmable Logic Controllers
Mr. Klouser 303-344-4910 x27773,

Syllabus
Course Length 17.5 days, 3 hours/day (52.5 clock hours),
3 Credits
Note: Independent Studies Course 67.5 clock hours

Text:
Introduction to Programmable Logic Controllers
Glen A. Mazur, William J. Weindorf
ATP Publications

Optional
Lab Manual

Description: Introduces the basic skills needed for many careers in electronics and related fields. Covers the operations and applications of basic DC and AC circuits consisting of resistors, capacitors, inductors, transformers and diodes. Emphasizes the use of common test instruments in troubleshooting.

Competencies:

Competencies View:
• Discuss the evolution and history of relay logic controls from electromechanical relays, drum switches, mechanical timers/counters, etc. to the multiprocessor, multitasking Programmable Logic Controllers (PLC) systems used today.
• Define critical terminology used with PLC’s and PLC controlled automation systems.
• Match definitions with a broad range of terms used in PLC controlled automation systems.
• Describe typical and specific applications of Programmable Controllers in the manufacturing sector.
• Name and describe the function of each block in a PLC system block diagram.
• Label and describe the major parts on the electronic schematic for a PLC digital input and output card.
• Differentiate between sinking and sourcing input/output interface circuits.
• Demonstrate the different voltage measurement methods for testing sinking as opposed to sourcing input/output cards.
• Demonstrate quality wiring practices while interfacing equipment to PLC I/O cards.
• Draw the symbols and explain the three basic elements of relay logic: normally open contacts, normally closed contacts and coils.
• Correlate the on/off status of internal bit addresses with the conditions of the corresponding I/O terminals and devices.
• Enter, download and test a PLC ladder diagram using PLC programming software.
• Use online monitoring to locate and record the status of inputs, outputs, and program logic during the operation cycle of machines and processes.
• Correlate ladder programs logic with machines and process descriptions.
• Write ladder logic programs based on machine and process descriptions.
• Use on line monitoring to locate and record critical PLC status information.
• Discuss safety considerations in the configuration, programming and maintenance of PLC hardware and software.
• Discuss advanced PLC topics including analog I/O, intelligent I/O modules, PLC networking etc.
• Demonstrate proper and safe practices while removing and replacing PLC modules.
• Apply a methodical troubleshooting approach to locate malfunctioning I/O devices (switches, sensors, relays, solenoids etc.) on PLC controlled machines and processes.

Apply a methodical troubleshooting approach to diagnose and correct malfunctions within the PLC itself.
Description
Covers the fundamentals of programmable logic controllers (PLCs) as they are applied in robotics and automation. Includes history, terminology, typical applications, hardware, and software. Incorporates lab and project activities that address operating, monitoring, programming, troubleshooting, and repairing PLC controlled lab trainers as well as actual industrial equipment.

Prerequisites and Co-requisites will be determined by each individual institution.

Outline View:

- PLC and Electrical Safety
  - Read Chapter 1
  - Activity 1-1
  - Activity 1-4
  - Quiz 1 Safety
- Electrical Principles of PLCs
  - Read Chapter 2
  - Activity 2-1
  - Activity 2-2
  - Activity 2-3
  - Quiz 2 Electrical Principles
- Electrical Circuits and PLCs
  - Read Chapter 3
  - Activity 3-1
  - Activity 3-2
  - Activity 3-3
  - Quiz 3 Electrical Circuits
- PLC Hardware
  - Read Chapter 4
  - Activity 4-1
  - Activity 4-2
  - Activity 4-3
  - Quiz 4 Hardware
- PLC Programming Instructions
  - Read Chapter 5
  - Activity 5-1
  - Activity 5-2
  - Activity 5-3
  - Quiz 5 Programming Instructions
- Programming PLC Timers and Counters
  - Read Chapter 6
  - Activity 6-1
  - Activity 6-2
  - Activity 6-3
  - Quiz 6 Timers and Delays
- PLC and System Interfacing
  - Read Chapter 7
  - Activity 7-1
  - Activity 7-2
  - Activity 7-3
  - Quiz 7 System Interfacing
- PLC Installation and Startup
  - Read Chapter 8
  - Activity 8-1
  - Activity 8-2
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- Activity 8-3
- Quiz Installation and Startup
  - PLC and System Maintenance
    - Read Chapter 9
    - Activity 9-1
    - Activity 9-2
    - Activity 9-3
    - Quiz 9 System Maintenance
  - Troubleshooting Principles and Test Instruments
  - Troubleshooting and PLC Hardware
  - Troubleshooting with PLC Hardware

Instructor may require additional assignments not listed above
Grading:

<table>
<thead>
<tr>
<th>Grade Scale:</th>
<th>Grade Breakdown</th>
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<tbody>
<tr>
<td>92 -100%</td>
<td>20% Job Readiness</td>
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<tr>
<td>84 - 91%</td>
<td>40% Classroom Assignments</td>
</tr>
<tr>
<td>71 - 83%</td>
<td>40% Lab Assignments</td>
</tr>
<tr>
<td>60 – 70%</td>
<td>100% Course Total</td>
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<td>&lt; 60%</td>
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Grade Factors: Some of the factors affecting the grade for this course. This is only a partial list. Other items may be added at instructor’s discretion.

Job Readiness (20%)
- Safety
- Attendance
- Promptness to class
- Horseplay (Clowning around)

Classroom Assignments (40%)
- Quizzes
- In class Exercises
- Tests

Lab Assignments (40%)
- All required Activities/Labs
- All required Lab Experiments (Black Box Labs etc.)

Notebooks: notes continue to be a vital part of this course. At anytime, the instructor may ask for a review of your notes. Notebooks will be analyzed on contents, order, etc.

Having a well-done notebook will improve your grade!

Attendance: Attendance will be monitored by use of the time card system introduced in the class. Failure to adhere to the attendance policy established by the Electronics Technology program will adversely affect your grade.

ID cards: ID cards will be issued to students and are required when on Pickens Technical College campus.

Your Responsibilities: You are required to:
- attend class daily
- not be tardy (be on time) this includes after break
- complete all assignments on time
- prepare for class before class
- be attentive in class and during lecture
- make-up all assignments within 2 days from 1 day’s absence
- follow prescribed safety practices
- others

As a student at Pickens Tech Center and the Electronics Department, your responsibility includes to learn the trade of Electronics Technology. In addition, you are required to adhere to Pickens Tech policy and APS rules and regulations as defined in the “Safe Schools” manual received at the beginning of the semester. Your effort directly affects your performance. Your performance will be reflected in your course grade.

Your success is a direct relationship to your effort, both in this course and whatever you do.