BAKER COLLEGE
STUDENT LEARNING OUTCOMES

MATT3210 Advanced Programmable Logic Controller Application
3 Semester Credit Hours

Student Learning Outcomes and Enabling Objectives

1. Create programs in Ladder Logic using the following instructions in an application
   a. Use in programming: XIC, XIO, OTE, OTL, OUT, TON, TOF, RTO
   b. Use in programming: CTU, CTD, RES, MOV, COP, MVM, EQU, GEQ
   c. Use in programming: GRT, LEQ, LES, LIM, MEQ, NEQ, SQO, JMP, LBL, JSR, SBR, MCR, ON.
2. Program PLC timers and counters.
   a. Describe the structure and addressing of timer instructions
   b. Illustrate how to use TON, TOF, and RTO timer instructions
   c. Explain the use and application of RES instructions
   d. Demonstrate how free running timers and cascade timers are used.
   e. Illustrate how to use CTU and CTD counter instructions.
3. Develop and implement Human Machine Interfaces (HMI)
   a. Configure the HMI to communicate with the Programmable Logic Controller (PLC).
   b. Define the parameters for the following objects to interact with the programmable controller applications: Drawing Pushbutton Indicators Numeric and String Gauge and Graph Navigation
   c. Construct and transfer the runtime file for the HMI applications.
   d. Construct an alarm screen to list process errors.
   e. Construct message screens for the PLC/HMI applications.
   f. Define passwords for the PLC/HMI applications.
4. Analyze a problem with a systematic approach to troubleshoot an automated system.
   a. Identify the installation considerations for enclosures and power supplies.
   b. Identify the installation considerations regarding electrical noise.
   c. Demonstrate PLC wiring methods.
   d. Explain the checks involved in PLC startup and safety considerations.
5. Analyze a problem with a systematic approach to troubleshoot an automated system.

     a. Demonstrate a systematic approach using observations, test instruments, and software to determine the source of the problem.

     b. Identify using a systematic approach specific to mechanical troubleshooting as to the cause and resolution of the problem.

     c. Identify using a systematic approach specific to fluidic troubleshooting as to the cause and resolution of the problem.

     d. Identify using a systematic approach specific to electrical troubleshooting as to the cause and resolution of the problem.

     e. Identify using a systematic approach the cause and resolution of a control Problem.

     f. Demonstrate the use of on-line editing to correct a system problem.

6. Explore analog principles
     a. Explain the difference between analog and digital circuits.
     b. Describe how PLC's and variable frequency drives operate in analog circuits.
     c. Identify types of signals.

7. Demonstrate the use of analog data in PLCs
     a. Explain the concepts of electrical signal conversion to digital values.
     b. Explain resolution of the analog signals.
     c. Identify the use of data for the scaling of analog inputs.
     d. Identify the use of data for the scaling of analog outputs.
     e. Create programs with analog signals in ladder logic applications.
     f. Provided a screen shot from the Device Configuration Properties Dialog Box, Match the Module Properties for an Analog Module to a given list:
          i. Output Type (Voltage / Current)
          ii. Output Rangeh
          iii. Smoothing (weak, medium, strong)
          iv. Substitute value for channel on a change from Run to Stop (output)

Big Ideas and Essential Questions

Big Ideas
- Industrial Safety Foundations of Electricity and PLC's
- The Role of PLC's
- Production Efficiency
- Components

Essential Questions

1. Why is safety the first priority?
2. How do I determine if a process is unsafe?
3. Why is it important to consider process efficiencies?
4. How do I determine what logic to utilize in processes?
5. What impact does an incorrect usage have on a product or process?
6. How are different components used?
7. How does documentation impact industrial communication between shifts?
8. What are the potential uses in the future?

These SLOs are not approved for experiential credit.

Effective: Summer 2023