**Oakton Community College**

**Programmable Controllers (PLC)**

**I.     Course Prefix/Number:** MFG 240

**Course Name:** Programmable Controllers (PLC)

**Credits:** 4 (3 lecture; 3 lab)

**II.    Prerequisite**

Knowledge of basic electricity is required.

**III.   Course (Catalog) Description**

This course teaches the fundamentals of programmable controllers (PLC) systems. Subjects include: Control system power distribution wiring, sensors and air valve interfaces, discrete I/O interface circuits, flow charting and state diagrams of machine sequences, ladder logic programming, machine diagnostic programming and HMI display programming. Labs are taught using the Allen Bradley SLC-500 controllers. HMI displays used are Allen Bradley’s Panel View 600 series terminals. All programs are written using RSLogix 500 software.

**IV.   Learning Objectives**

Students will learn I/O interfacing between the PLC controller and devices such as switches, proximity switches, limit switches, lamps, solenoids, valves, and other control devices. Once the hardware design is complete and understood, students will be instructed in how to write ladder logic programs to control the machine in a safe and efficient manner. In addition the student will be instructed in writing diagnostic programs to monitor the machine and control program to find faults and prompt the operator as to what went wrong.

**V.    Academic Integrity**

Students and employees at Oakton Community College are required to demonstrate academic integrity and follow Oakton's Code of Academic Conduct. This code prohibits:

• cheating,
• plagiarism (turning in work not written by you, or lacking proper citation),
• falsification and fabrication (lying or distorting the truth),
• helping others to cheat,
• unauthorized changes on official documents,
• pretending to be someone else or having someone else pretend to be you,
• making or accepting bribes, special favors, or threats, and
• any other behavior that violates academic integrity.

There are serious consequences to violations of the academic integrity policy. Oakton's policies and procedures provide students a fair hearing if a complaint is made against you. If you are found to have violated the policy, the minimum penalty is failure on the assignment and, a disciplinary record will be established and kept on file in the office of the Vice President for Student Affairs for a period of 3 years.
Details of the Code of Academic Conduct can be found in the Student Handbook.

**VI.   Sequence of Topics**

Class #1:
Introduction to control system wiring and ladder logic wiring diagrams, binary mathematics and number systems, I/O (input and output) types, modules and wiring concepts.

Class #2:
Introduction to ladder rung logic statements, processor I/O scan sequences, processor memory and file layout, power wiring to the processor.

Class #3:
Introduction to flow charting and creating state diagrams for mechanism sequences, converting these to ladder logic programs, a simple machine program, the use of latched and unlatched output instructions to keep track of a mechanisms progress during a program.
Introduction to RSLogix 500 software and the students first Lab Project.

Class #4:
Introduction to timer functions and their use in ladder programs. Example programs using timers instructions for pulse generation, delaying functions, extending pulse size, anti-tie down protection in machine operation.
Lab projects.

Class #5:
Introduction to counter instructions and their use in ladder programs. Example programs using counters to extend long time accumulations, counting to a set value, changing count values as part of the program function. Lab projects.

Class #6:
First test and lab projects.

Class #7:
Introduction to manually activated machine control programming. Example programs for controlling single cycle operation, ant-tie down requirements to meet OSHA requirements. Lab projects. First Group project assigned.

Class #8:
Introduction to continuously running machines or processes. Start up and shut down safety sequences to meet OSHA requirements, introduction to the 3 state machine concept and ladder subroutines. Lab Projects.

Class #9:
Data control and handling in process control programs. Introduction to bit shift and FIFO instructions. Example program using a word shift register to accumulate data as a product moves down an assembly line and using that accumulated data to make sorting decisions at the end of the line. Lab Projects.

Class #10:
Introduction to math instructions, data move instructions for down loading menus or recipes. Introduction to sequencer instructions. Example programs using a sequencer instruction to control a machine in manual or setup mode.
Lab Project. Second Group project assigned.

Class #11:
Second Test, lab projects.

Class #12:
Introduction to Diagnostic programming techniques. Designing ladder rungs to monitor processes, prompt operators for problems and warnings, setting up the man / machine interface, introduction to display devices. Lab Projects.

Class #13:
Introduction to Panel View Terminal programming concepts, display setup for man / machine interface, introduction to tag lists and the panel builder software.

Class #14:
Lab projects

Class #15:
Lab projects

Class #16:
Final test and all lab projects are due.

The instructor reserves the right to make adjustments to the above schedule by informing the class accordingly.

**VII.  Methods of Instruction**

Classroom discussions, handout materials, lab projects.
Course may be taught as face-to-face, media-based, hybrid or online course.

**VIII. Course Practices Required**

Handouts: Sample programs and Student Lab Manuals.
Lab projects.

**IX.   Instructional Materials**

**Note:** Current textbook information for each course and section is available on Oakton's Schedule of Classes.

Programmable Controllers using the Allen Bradley SLC 500 Family
Author : David Geller
ISBN: 0-13-096208-2

**X.    Methods of Evaluating Student Progress**

3 test will be given as shown on the topic outline.
1 Group project will be assigned.
All 13 lab projects must be completed for a perfect lab grade of 100.
Your 3 test grades, group project grade and the lab grade will be averaged to arrive at a final grade.

Grading Scale: Lab Grade Scale:
90 – 100 A Lab 13 complete 100
80 – 89 B Lab 12 complete 95
70 – 79 C Lab 11 complete 90
60 – 69 D Lab 10 complete 85
59 & below F Lab 9 complete 80
Lab 8 complete 70
Less than Lab 8 50

Students who miss more than 4 classes will be lowered one letter grade.

**XI.   Other Course Information**

If you have a documented learning, psychological, or physical disability you may be entitled to reasonable academic accommodations or services. To request accommodations or services, contact the Access and Disability Resource Center at the Des Plaines or Skokie campus. All students are expected to fulfill essential course requirements. The College will not waive any essential skill or requirement of a course or degree program.

 **XII. Instructor:**

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