# Department Master Syllabus Camden County College Blackwood, New Jersey

**Course Title:** Advanced PLC Programming

**Course Number**: CIM-212

**Department/Program Affiliation:** Computer Integrated Manufacturing Engineering Technology

**Date of Review:** October 2022

(This Department Master Syllabus has been examined by the program/department faculty members and it is decided that no revision is necessary at this time.)

**Date of Last Revision**: October 15, 2009

(This Department Master Syllabus has been examined by the program/department faculty members and it is decided a change requiring a revision is necessary at this time.)

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| **Credits:** | 3 |  | | | |
| **Contact Hours:** | Lecture | 2 | Lab | 2 | Other 0 |

**Prerequisites:** PLC Programming (CIM-211)

**Co-requisites:** None

**Course Description:** This course, formerly entitled Industrial Controls Systems, is a continuation of CIM-211, PLC Programming. Students will use the RS Logix-500 software package, running under the Windows operating system to investigate the advanced functions of the Allen-Bradley SLC-5/02 Programmable Logic Controller (PLC). This is chiefly a lab- oriented course. Preparatory lectures will accompany each lab assignment. Topics covered will include transitional bits, bit forcing, PLC networking and telephony, bit and data manipulation, shift registers, and analog I/O. Program control using master and zone control relays, sequencers, and subroutines will be investigated.

**Course Student Learning Outcomes:** (Cognitive, Psychomotor, Affective Domains) Upon completion of this course the students will be able build upon their knowledge gained in the first-level PLC Programming course (CIM-211) and:

1. Use analog Allen-Bradley SLC input modules to accurately monitor and record the state of analog phenomena encountered in a typical manufacturing environment. Via several hands-on exercises, students will demonstrate their ability to interpret the Analog Input/Output image tables of the PLC while the course instructor looks on. The course instructor will inspect each program for accuracy and the students will be required to submit Lab Reports for each major hands-on exercise.
2. Develop program code which can energize analog output devices found in the typical manufacturing environment. Students will demonstrate acumen in this SLO and SLO #4 below by individually authoring PLC programs that control and monitor Analog input and output devices. The students will author and submit Lab Reports. The course instructor will also check the workings of each student’s program and grade each Lab Report.
3. Use program control instructions including subroutines, master control relays, interrupts, and jumps to develop functional Relay Ladder Logic (RLL) programs. The students will

demonstrate acumen in this SLO by writing and executing PLC programs that utilize each of these programming instructions. They will then submit a Lab Reports which will be graded by the course instructor.

1. Author, upload, download, debug, and edit PLC programs which include analog input and output elements.
2. Develop PLC programs which make use of the many arithmetic and mathematic functions available in the SLC family of processors. The students will demonstrate acumen in this SLO by writing and executing PLC programs that utilize each of these programming instructions. They will then submit a Lab Reports which will be graded by the course instructor.
3. Prepare high-quality written lab reports describing PLC control problem solutions and implementations. The course instructor will assess each student’s Lab Report in accordance with an established rubric.

# General Education Student Learning Outcomes (if applicable)

N/A

# Course Outline:

The will be 13 to 16 graded labs in this course depending upon the pace of the students. All students will individually submit the same number of labs. Lecture/Lab topics will include but are not limited to the following in roughly the following order:

1. DH-485 Networking
2. Subroutines (if not completed in part I of the PLC Programming sequence)
3. The Jump to Label Function
4. Master Control Relays
5. Advanced Timer Operations
6. Seeding Data Tables
7. Arithmetic/Mathematic Functions
8. Data Comparison Functions
9. Linear Equation Mathematics
   1. Slope
   2. The Y-intercepts
   3. Algebraic Manipulation
10. Analog Input and Output
11. The Sequencer
12. Shift Registers
13. Forcing I/O
14. The Temporary End Instruction
15. Data Moves and Moves Masks
16. Selectable Timed Interrupts
17. Programming the PanelView Man-machine Interface
18. Characterization of an “Unknown” Analog Input Device

**Course Activities:** Lectures and assorted hands-on lab activities.

**Assessment of Student Learning Outcomes:** Grading will be based solely upon hands-on Lab assignments. There will be PLC labs assigned to be completed by each student individually.

Each lab is worth ten points.

Lab grades will be based upon the student first implementing a correct, robust solution and submitting that same solution in hard copy the following week. Lab grades will be reduced two points for each calendar day late. A weekend counts as one calendar day.

# Course Materials:

**Textbook(s):** Petruzella, Frank D., Programmable Logic Controllers, Latest Edition, Glencoe McGraw-Hill, New York, New York

**Supplemental Materials**: A thumb drive should be purchased by the student for program

storage and tutorial distribution.