

SOUTHEAST COMMUNITY COLLEGE
CONSTRUCTION MANUFACTURING AND TECHNOLOGY DIVISION
Electronic Systems Technology Program
Revision Date: January 11, 2021

I. CATALOG DESCRIPTION

Course Number: ELEC2863
Course Title: Programmable Logic Controllers in Automation Systems
Prerequisite(s): ELEC1245 or Program Chair Approval
Catalog Description: An introduction to the usage and programming of Programmable Logic Controllers (PLC's) and the utilization of transducers/sensors in industrial automation with supporting labs.

Credit Hours: 3
Class Hours: 30
Lab Hours: 45
Total Contact Hours: 75

II. COURSE OBJECTIVES: *Course will:*

- A. Allow the student to program and operate a Programmable Logic Controller.
- B. Allow the student to integrate a PLC with external sensors and incorporate into the programming.
- C. Emphasize all safety standards with working with electronic systems.

III. STUDENT LEARNING OUTCOMES AND GENERAL EDUCATION LEARNING OUTCOMES:

- A. Student Learning Outcomes: *Student will be able to:*
 - 1. Explain a variety of equipment that they may encounter in industry and how this equipment operates and interoperates into a manufacturing environment.
 - 2. Demonstrate the ability to interface with I/O devices and create a program to perform a control loop function.
 - 3. Demonstrate the ability to properly connect and program a PLC in various manufacturing process control situations.
 - 4. Wire 24 DC I/O devices to a PLC.
 - 5. Demonstrate the ability to properly interface a PLC with motor control devices.
- B. General Education Learning Outcomes (GELOs)
 - 1. GELO #3: Critical Thinking & Problem Solving
 - 2. Outcome 2: Synthesize information to arrive at reasoned solutions to problems.

IV. CONTENT/TOPICAL OUTLINE -Hours indicate classroom only.

- A. Allen-Bradley 1000 & 1500 Micrologix PLC Architecture, 6 Hours
 - 1. CPU, Memory, I/O and Power Supply
 - 2. Fixed I/O and Modular controllers
 - 3. Slot Numbers
 - 4. Program and Data Files
 - 5. Addresses
 - 6. I/O Configuration
- B. Micrologix Wiring Connections, 2 Hours
 - 1. 120 VAC Inputs
 - 2. 24 VDC Inputs
 - 3. Sinking and Sourcing Circuits
 - 4. Relay Outputs

- 5. Triac Outputs
- 6. E-Stop and Fusing
- C. Basic Instructions, 3 Hours
 - 1. Relay Instructions: XIC, XIO, OSR, OTE, OTL and OTU
 - 2. Timer Instructions: TON, TOF and RTO
 - 3. Counter Instructions: CTU, CTD and RES
- D. Additional Instructions, 3 Hours
 - 1. Comparison Instructions
 - a. LES, GRT, LEQ, and GEQ
 - 2. Math Instructions
 - a. ADD, SUB, MUL, and DIV Instructions
 - b. Integer and Floating Point files
 - 3. Data Handling Instructions
 - a. MOV and MVM
- E. RS Logic Programming Software, 10 Hours
 - 1. Offline and Online
 - 2. Online and offline configuration
 - 3. Offline Programming
 - 4. Insert and Append
 - 5. Monitoring Programs and Data Online
 - 6. Forces and Toggles
 - 7. Faults
 - 8. Creating and Printing Reports
 - 9. Documentation: Page Title, Rung, Instruction, and Address Comments
- F. Sequences, 3 Hours
 - 1. State Machine Programming for sequential applications
 - a. Programming the ENI Module
 - b. Messaging between controllers
 - c. Controller channel configuration
- G. Transducers, 3 Hours
 - 1. Limit switches
 - 2. Proximity sensors
 - 3. Photo detectors
- H. PLC wiring and Programming (Lab, 45 Hours)
 - 1. Converting relay diagrams to PLC programs
 - 2. Timer and Counter programming
 - 3. Event and time drive sequencers
 - 4. Math Operations

V. INSTRUCTIONAL MATERIALS

- A. Required Text(s): Rehg, James A., Sartori, Glenn, *Programmable Logic Controllers*, 2nd Edition, Pearson PH, 2009, ISBN: 0-13-504881-8, and Internet Resources as directed by the Instructor
- B. Supplies: Flash Drive, Lab tools

VI. METHODS OF PRESENTATION/INSTRUCTION

- A. Methods of presentation typically include a combination of the following:
 - 1. Technology enhanced lecture
 - 2. Classroom discussion
 - 3. Interactive group activities
 - 4. Audio visual materials

5. Presentation by experts for the Electronics and Networking Industry

VII. METHODS OF EVALUATION

- A. Methods of evaluation, although determined by the individual instructor, traditionally includes a combination of the following:
 1. Attendance and participation
 2. Daily assignments
 3. Written exams and/or quizzes
 4. Performance and observational assessment

VIII. SPECIFIC COURSE REQUIREMENTS

- A. A minimum grade of D is required.
- B. Credit by Examination: Credit for the course CANNOT be earned through Credit by Examination.