

## Washtenaw Community College Comprehensive Report

### ELE 224 Programmable Controllers (PLCs) I

Effective Term: Spring/Summer 2018

#### Course Cover

**Division:** Advanced Technologies and Public Service Careers

**Department:** Industrial Technology

**Discipline:** Electricity/Electronics

**Course Number:** 224

**Org Number:** 14400

**Full Course Title:** Programmable Controllers (PLCs) I

**Transcript Title:** Prog. Controllers (PLCs) I

**Is Consultation with other department(s) required:** No

**Publish in the Following:** College Catalog , Time Schedule , Web Page

**Reason for Submission:** Three Year Review / Assessment Report

#### **Change Information:**

**Consultation with all departments affected by this course is required.**

**Course title**

**Course description**

**Outcomes/Assessment**

**Objectives/Evaluation**

**Rationale:** 3 year review and update

**Proposed Start Semester:** Spring/Summer 2018

**Course Description:** This is an introductory, lab-based course which covers PLC hardware, and relay-type, timer, counter, data manipulation, math and program control instructions, with an emphasis on troubleshooting. Weekly labs use Allen Bradley SLC, PLC-5 and ControlLogix controllers and RSLogix software. This course is intended for Industrial Electronics and Mechatronics students, electricians, electrician (and other) apprentices, technicians and engineers. The title of this course was previously Introduction to PLCs.

#### Course Credit Hours

**Variable hours:** No

**Credits:** 4

**Lecture Hours: Instructor:** 60 **Student:** 60

**Lab: Instructor:** 30 **Student:** 30

**Clinical: Instructor:** 0 **Student:** 0

**Total Contact Hours: Instructor:** 90 **Student:** 90

**Repeatable for Credit:** NO

**Grading Methods:** Letter Grades

Audit

**Are lectures, labs, or clinicals offered as separate sections?:** NO (same sections)

#### College-Level Reading and Writing

College-level Reading & Writing

## **College-Level Math**

No Level Required

### **Requisites**

#### **Level II Prerequisite**

ELE 111 minimum grade "C-"  
or equivalent

### **General Education**

### **Request Course Transfer**

**Proposed For:**

### **Student Learning Outcomes**

1. Install, troubleshoot and maintain PLC-controlled systems by applying knowledge of PLC hardware, PLC operation, electrical prints, programs, monitoring software, and troubleshooting procedures.

#### **Assessment 1**

Assessment Tool: A departmental final exam will be used to assess understanding of key concepts

Assessment Date: Fall 2020

Assessment Cycle: Every Three Years

Course section(s)/other population: At least 3 sections

Number students to be assessed: All students in at least 3 sections

How the assessment will be scored: Departmentally-developed answer key

Standard of success to be used for this assessment: Students will correctly answer 70% of the questions related to the outcome

Who will score and analyze the data: Faculty who teach the class

#### **Assessment 2**

Assessment Tool: Departmental lab quizzes will be used to assess proficiency in applying the concepts and in performing hands-on tasks

Assessment Date: Fall 2020

Assessment Cycle: Every Three Years

Course section(s)/other population: At least 3 sections

Number students to be assessed: All students in at least 3 sections

How the assessment will be scored: Departmentally-developed answer key

Standard of success to be used for this assessment: Students will correctly answer 70% of the questions related to the outcome

Who will score and analyze the data: Faculty who teach the class

2. Develop, interpret and troubleshoot PLC programs with relay-type, timer, counter, data manipulation, math and program control instructions using PLC programming and monitoring software.

#### **Assessment 1**

Assessment Tool: A departmental final exam will be used to assess understanding of key concepts

Assessment Date: Fall 2020

Assessment Cycle: Every Three Years

Course section(s)/other population: At least 3 sections

Number students to be assessed: All students in at least 3 sections

How the assessment will be scored: Departmentally-developed answer key

Standard of success to be used for this assessment: Students will correctly answer 70% of the questions related to the outcome

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### **Assessment 2**

Assessment Tool: Departmental lab quizzes will be used to assess proficiency in applying the concepts and in performing hands-on tasks

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Assessment Cycle: Every Three Years

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Who will score and analyze the data: Faculty who teach the class

### **Course Objectives**

1. Identify the characteristics of PLC hardware components, including chassis, power supply, CPU, I/O modules.
2. Read and interpret PLC electrical prints and relate them to hardware components.
3. Recognize and apply the operating principles of PLCs including memory, data types, data tables, scan cycle, I/O addresses, number systems, program restrictions and CPU modes.
4. Develop, interpret and troubleshoot ladder logic programs that interface to discrete I/O devices including start and stop buttons, selector switches, pneumatic valves, and motor starters.
5. Develop, interpret and troubleshoot ladder logic containing relay-type instructions, including normally open and normally closed contacts, coils, and combinational logic.
6. Develop, interpret and troubleshoot ladder logic programs that include "bit" instructions, latching outputs, and internal relays.
7. Develop, interpret and troubleshoot ladder logic containing timer instructions, including on-delay and off-delay timers, retentive timers.
8. Develop, interpret and troubleshoot ladder logic containing counter instructions.
9. Develop, interpret and troubleshoot ladder logic containing data manipulation instructions, including move, compare, math, and file manipulation.
10. Develop, interpret and troubleshoot ladder logic containing program control instructions, including jump, subroutine, and MCR.
11. Develop, interpret and troubleshoot ladder logic for simple event-driven sequential systems using structured program design.
12. Use PLC software to create, edit, document, print, download, monitor, test, troubleshoot, print out and back up ladder logic programs.
13. Analyze and troubleshoot complete PLC-controlled systems utilizing a systematic process, electrical prints, software tools, indicator lights, manuals, and test equipment.
14. Identify and demonstrate the proper techniques for PLC installation and maintenance.

### **New Resources for Course**

### **Course Textbooks/Resources**

Textbooks

Petruzella, F. *Programmable Logic Controllers*, ed. McGraw Hill, 2017

Manuals

Petty, D.. ELE 224 Coursepack, Petty, D., 08-01-2017

Periodicals

Software

**Equipment/Facilities**

Level III classroom

Computer workstations/lab

<b><u>Reviewer</u></b>	<b><u>Action</u></b>	<b><u>Date</u></b>
<b>Faculty Preparer:</b>		
<i>Dale Petty</i>	<i>Faculty Preparer</i>	<i>Jul 05, 2017</i>
<b>Department Chair/Area Director:</b>		
<i>Thomas Penird</i>	<i>Recommend Approval</i>	<i>Jul 06, 2017</i>
<b>Dean:</b>		
<i>Brandon Tucker</i>	<i>Recommend Approval</i>	<i>Jul 18, 2017</i>
<b>Curriculum Committee Chair:</b>		
<i>Lisa Veasey</i>	<i>Recommend Approval</i>	<i>Nov 06, 2017</i>
<b>Assessment Committee Chair:</b>		
<i>Michelle Garey</i>	<i>Recommend Approval</i>	<i>Nov 07, 2017</i>
<b>Vice President for Instruction:</b>		
<i>Kimberly Hurns</i>	<i>Approve</i>	<i>Nov 07, 2017</i>