ELEC 153 Course Outline as of Spring 2022

CATALOG INFORMATION

Dept and Nbr: ELEC 153 Title: PLC: PROGRAM LOGIC CONTR Full Title: Programmable Logic Controllers Last Reviewed: 4/22/2019

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	3.00	Lecture Scheduled	2.50	17.5	Lecture Scheduled	43.75
Minimum	3.00	Lab Scheduled	1.50	6	Lab Scheduled	26.25
		Contact DHR	0		Contact DHR	0
		Contact Total	4.00		Contact Total	70.00
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 87.50

Total Student Learning Hours: 157.50

Title 5 Category:	AA Degree Applicable
Grading:	Grade Only
Repeatability:	00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:	
Formerly:	ELEC 53

Catalog Description:

Fundamentals of programmable logic controllers (PLC), including PLC types, input and output devices, and ladder logic programming.

Prerequisites/Corequisites:

Recommended Preparation:

Limits on Enrollment:

Schedule of Classes Information:

Description: Fundamentals of programmable logic controllers (PLC), including PLC types, input and output devices, and ladder logic programming. (Grade Only) Prerequisites/Corequisites: Recommended: Limits on Enrollment: Transfer Credit: Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree: CSU GE:	Area Transfer Area	Effective: Effective:	Inactive: Inactive:
IGETC:	Transfer Area	Effective:	Inactive:
CSU Transfer	: Effective:	Inactive:	
UC Transfer:	Effective:	Inactive:	

CID:

Certificate/Major Applicable:

Both Certificate and Major Applicable

COURSE CONTENT

Student Learning Outcomes:

At the conclusion of this course, the student should be able to:

- 1. Establish electronic communication between a programmable logic controller (PLC) and a personal computer.
- 2. Write and document ladder logic programs for a PLC.
- 3. Install and test a ladder logic program for a PLC.
- 4. Identify and troubleshoot PLC program problems.

Objectives:

At the conclusion of this course, the student should be able to:

- 1. Design ladder logic programs and assemble documentation.
- 2. Modify programs using touch screens and teaching pendants.
- 3. Program a PLC using ladder logic and one additional PLC language.
- 4. Identify, troubleshoot, and repair faults in sensors and output devices.
- 5. Identify, troubleshoot, and resolve software problems.
- 6. Originate proper tag-out procedures when working on electrical equipment.
- 7. Interpret and apply safety procedures in a manufacturing environment.

Topics and Scope:

- I. Types of Input and Output Devices
 - A. Relay devices
 - B. Analog devices
- II. Types of Controllers
- III. Types of Software
- IV. Fundamental Operation of PLCs
 - A. Relay inputs and outputs
 - B. Analog inputs and outputs
 - C. Counters
 - D. Timers
- V. Program Control Instructions
 - A. Jump instructions

- **B** Subroutines
- C. Sequencers
- VI. Electrical Tag-Out Procedures
- VII. Basic Manufacturing Safety

VIII. Wiring

- A. Direct current (DC) inputs
- B. Alternating current (AC) inputs
- C. Relay outputs
- D. Transistor outputs
- IX. PLC Output Devices
 - A. Analog
 - B. Relay
- X. Troubleshooting Techniques
 - A. PLC
 - B. Sensors
 - C. Related software
- XI. Touchscreens and Teaching Pendants
- XII. Human-Machine Interface (HMI)
 - A. Operation
 - B. Limitations
- XIII. Laboratory Topics
 - A. Safety procedures
 - B. Allen-Bradley programming environment
 - C. PLC inputs and outputs
 - D. Numbering systems
 - E. Programming logic operations
 - F. Wiring a PLC
 - G. Troubleshooting techniques

Assignment:

Lecture-Related Assignments:

- 1. Reading (10-30 pages per week)
- 2. Homework problems:
 Design and interpret relay logic programs (1-2)
 Design and interpret ladder logic programs (1-4)
 Modify ladder logic programs (1-4)
 Assemble software documentation for programs written in two different programming
- languages (1-4) 3. Quizzes (3-6), midterm, and final exam

Lab-Related Assignments:

1. Laboratory assignments (5-12) including demonstrating operation of a PLC system

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Program documentation	Writing 20 - 50%
Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.	
Homework problems	Problem solving 20 - 30%
Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.	
Laboratory assignments including demonstration of PLC operation	Skill Demonstrations 10 - 30%
Exams: All forms of formal testing, other than skill performance exams.	
Quizzes, midterm and final exam	Exams 20 - 40%
Other: Includes any assessment tools that do not logically fit into the above categories.	
None	Other Category 0 - 0%

Representative Textbooks and Materials: Programmable Logic Controllers. 5th ed. Petruzella, Frank. McGraw-Hill. 2017