ELEC 153 Course Outline as of Fall 2013

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 (PLCs), 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 (PLCs), 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:	**Area**	Effective:	Inactive:
CSU GE:	**Transfer Area**	Effective:	Inactive:
IGETC:	**Transfer Area**	Effective:	Inactive:

CSU Transfer:	Effective:	Inactive:
UC Transfer:	Effective:	Inactive:

CID:

Certificate/Major Applicable:
Not Certificate/Major Applicable

COURSE CONTENT

Student Learning Outcomes:
Upon completion of the course, students will be able to:
1. Establish electronic communication between a PLC and a personal computer.
2. Write and document ladder logic programs for a PLC.
3. Install, and test the operation of, a ladder logic Program for a PLC.
4. Identify and troubleshoot PLC program problems.

Objectives:
Upon completion of the course the student will 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. PLCs
B. sensors
C. related software
XI. Touchscreens and teaching pendants
XII. Human-Machine Interface (HMI)
A. operation
B. limitations
XIII. Laboratory exercises
A. safety procedures
B. programming Allen Bradley RSLogix software
C. PLC inputs and outputs
D. numbering systems
E. programming logic operations
F. wiring a PLC
G. troubleshooting techniques
H. programming Siemens Step7 software

Assignment:

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. Laboratory assignments (5-12) including demonstrating operation of a PLC system
4. Quizzes (3-6), midterm, and final exam

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:
Petruzella, Frank. Programmable Logic Controllers, 4th edition, McGraw-Hill, 2011.
Rabiee, Max. Programmable Logic Controllers Hardware and Programming, 3rd edition, Goodheart-Willcox, 2012.