Course Number & Name **EECS 4220/5220 – Programmable Logic Controllers**

Credits & Contact hours 3 Credits – 8:00-9:20 M, W - Palmer 2450, Labs – NE 2350/ NE 2390

Coordinator

Wm Ted Evans, PhD, PE

Textbook

Hybrid Text, Hybrid Lab Text, youtube videos

Course Information www.eng.utoledo.edu/~wevans

An introduction to programmable logic controllers (PLCs), process control algorithms, interfacing of sensors and other I/O devices, simulation and networking.

Prerequisite: EECS 3200.

Specific Goals- Students Learning Objectives (SLOs)

Elective course.

The student will be able to

1. Demonstrate knowledge of programmable logic controllers.
2. Demonstrate knowledge of process control systems.
3. Program using ladder logic programming of software.
4. Design PLC based system for process control.
5. Use digital and analog I/O.
6. Understand various timers, counters, fault and interrupt systems.
7. Define and design a PLC based process control system, its software/hardware design.
8. Write a report and present results.

Specific Goals - EAC Criterion 3 Outcomes

Outcome 1: Supported by SLO 1, 2, 3, 4 and 7.
Outcome 2: Supported by SLOs 1, 6.
Outcome 4: Supported by SLOs 6, 7.
Outcome 5: Supported by SLOs 1, 2, 3 and 8.
Outcome 6: Supported by SLO 4, 5.
Outcome 7: Supported by SLOs 2 and 3.

Topics

1. Introduction to Programmable Logic Controllers (PLCs) and its architecture
2. Input/output modules, power supplies, opto isolation and memory map
3. Allen-Bradley Compact Logix Instruction Set
4. Siemens Instruction Set
5. Addressing considerations for both PLC processors
6. IEC 61131-3 programming language standard
7. Ladder logic programming including combinational logic, branching and other rung conditions
8. Start/stop circuits, special contacts, transitional contacts, latching instructions, memory circuit constructs and S/R to Seal Circuit transfer
9. Timers, timing diagrams and examples for timer applications

10. Counter basic programming, Arithmetic, program control instructions
11. Control Panel Construction Standards
12. Control standards external to the Control Panel
13. Analog module-programming examples, Fault and interrupt service routines
14. Sequential Programming Concepts
15. Process control PLC programming including Faceplate
16. HMI Programming Organization
17. Siemens Function/Function Blocks
18. Motion Control of single axis motion systems
19. PID implementation including HMI

Class will be graded:

Labs	**40 %**
Midterm exam	**25 %**
Final Exam	**25 %**
Quizzes	**10 %**
(A >= 90, B >= 80, C > = 70, D > = 60)	
Midtern	**Class Period**
Final	**Class Period**

Read the restart text at:
https://www.utoledo.edu/rocket-restart/signage/pdf/rocket-restart-manual.pdf

There are no make-up exams for this course. If you have a problem or conflict and cannot attend an exam, let me know beforehand and we will try to work something out. No credit will be given for a missed exam that we haven't made arrangements about beforehand unless you have a ***really excusable*** emergency. Cell phone use will not be allowed. If you do not have a calculator, buy one and bring it to class.

Cheating is not allowed and will be punished by rules of U of Toledo Student Handbook.

Subject: RSLogix500 free tutorial link

The technote the tutorial says to go to isn't there when you search for it but if you click "downloads" and then "view all downloads" and then "find drivers and firmware" you will be at the product search page the technote would bring you to.

https://onlineplcsupport.com/free-rslogix-500-download-micro-starter

A list of labs is found on eng.utoledo.edu/~wevans under 'PLC Lab List'

For this course, 12 labs are required with the exception that through Lab Assn 7.2, you may choose only one of either Allen-Bradley or Siemens. For HMI labs, the choice is either Siemens, A-B Studio or A-B Factory View. You may write one PLC program that counts for three labs with the HMI chapter if desired. There are some labs marked with (*) which will count for double labs. They are significantly more difficult.

Lectures

Review Lecture	Chapter 1	
Review Lecture	Chapter 2	
Lab 2.1	Chapter 2 – pg 31-35	
Review Lecture	Chapter 3, 4	
Lab 4.1	Chapter 4 – pg 34-37	
Review Lecture	Chapter 5	
Lab 5.1		
Review Lecture	Chapter 6	
Review Lecture	Chapter 6 cont.	
Review Lecture	Chapter 7	
Lab 7.1		
Lab 7.2		
Review Lecture	Chapter 8	
Lab 8.1		
Review Lecture	Chapter 9	
Review Lecture	Chapter 10	
Lab 10.		
Review Lecture	Chapter 11	
Lab 11.1		
Test 1	Ch. 1-10	
Review Lecture	Chapter 12	
Review Lecture	Chapter 13	
Lab 13.		
Review Lecture	Chapter 14	
Lab 14.1		
Review Lecture	Chapter 15	
Review Lecture	Chapter 15 cont.	
Lab 15.		
Review Lecture	Chapter 16	
Lab 16.		
Review Lecture	Chapter 17	
Review Lecture	Chapter 17 cont.	
Lab 17.		
Review Lecture	Chapter 18	
Review Lecture	Chapter 19	
Review Lecture	Chapter 19 cont.	
Lab 19.		
Review Lecture	Chapter 20	
Lab 20.1		
Review Lecture	Chapter 21	
Lab 21.1		
Final		