ELEG 4463L – CONTROL SYSTEMS LABORATORY

Credits and Contact Hours

Three credit hours, 40 hours of instructor contact; weekly drill.

Instructor's Name

Randle Overbey

Textbook

Programmable Logic Controllers: An Emphasis on Design and Application, by Kelvin T. Erickson, 2nd Ed., Dogwood Valley Press, 2011

a. Other supplemental materials:
SLC 500 Instruction Set Reference Manual by Allen-Bradley, November 2008
LogixPro 500 Allen-Bradley PLC simulation software by The Learning Pit, Ontario, Canada

Specific Course Information

a. Catalog description:
Experimental study of various control systems and components. The use of programmable logic controllers in the measurement of systems parameters, ladder-logic applications, process-control applications, and electromechanical systems.

b. Pre-requisites or co-requisites:
Prerequisite: Microprocessor Systems Design (ELEG 3924) and System and Signal Analysis (ELEG 3124).
Co-requisite: Drill component.

c. Technical Elective

Specific Goals for the Course

1. Specific outcomes of instructions:
   a) Understand the fundamentals of motor controls and relay ladder logic and be able to design basic motor control circuits using relay ladder logic;
   b) Know the various PLC manufacturers and the PLCs produced by each manufacturer, along with the advantages and disadvantages of each;
   c) Program the SLC-500 PLC using ladder logic for selected applications;
   d) Use the function chart approach for sequential applications;
   e) Obtain hands-on experience for operating and programming the PLC system;
   f) Create and operate human-machine interface for PLC applications;
   g) Learn the fundamentals of PID controllers and be able to tune PID controllers using software;
   h) Understand the PLC communication network;
   i) Understand sensor and actuator fundamentals and be able to select the proper sensor and actuator for a specific PLC model and process control application.

2. Indicate the student outcomes listed in Criterion 3 addressed by the course:
   (a) Students are required to apply knowledge of mathematics, science, and engineering;
   (b) Students must demonstrate the ability to design and conduct experiments, as well as to analyze and interpret data;
   (c) Students must demonstrate the ability to design a system, component, or process to meet desired needs;
   (e) Students are required to identify, formulate, and solve engineering problems;
   (k) Students must demonstrate an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

List of Topics

1. Basic motor controls and ladder logic programming (4 classes)
2. Introduction to PLCs, basic PLC architecture, and PLC forms from various manufacturers (4 classes)
3. Memory organization and addressing, including forms and differences from major manufacturers (4 classes)
4. Timers, counters, comparison and computation instructions (4 classes)
5. PID control fundamentals, PID simulation, PID tuning; PLC PID instruction and other advanced instructions (5 classes)
6. Function chart approach for sequential applications (3 classes)
7. Sensor and actuator fundamentals (3 classes)
8. PLC input and output modules and selection criteria for sensors and actuators (5 classes)
9. PLC communication networks (2 classes)
10. Human-machine interface (2 classes)
11. Troubleshooting and selecting a PLC (2 classes)