ESYST 113 - Industrial Controllers

Approval Date:  Effective Term:

Department: ELECTRONIC SYSTEMS TECHNOLOGY
Division: Career Technical Education
Units: 4.00
Grading Option: Letter Grade
Transferability: CSU Transferable
Course is: AA/AS Degree
Contact Hours per Term:
   Lecture/Discussion: 3.00
   Lab: 3.00
Associate Degree GE Applicability: No
Recommended Class Size: 35

Discipline/Minimum Qualifications:
Electromechanical, Electronics, Industrial Technology

Catalog Description:
Presents basic control systems for process machines and driven equipment used in industry, including programmable controllers, basic electrical circuits, input devices, output devices, control diagrams, and specific programmable controller applications.

Schedule Description:
Presents basic control systems for process machines and driven equipment used in industry, including programmable controllers, basic electrical circuits, input devices, output devices, control diagrams, and specific programmable controller applications.

Student Learning Outcome:
Lecture

1. Compare and contrast controllers to determine which ones to connect to a given electromechanical system thereby providing flexibility and maximizing the system's capabilities.

Lab

1. Install and program a programmable controller to accomplish several different tasks on a given
Course Objectives:

Lecture

1. Compare and contrast the basic methods for controlling process machines and driven equipment in industry in terms of types, requirements, advantages, and disadvantages.
2. Compare and contrast analog devices and digital solid state devices used to control systems in industry.
3. Explain basic wiring requirements and code requirements for industrial control systems.
4. Describe the function of input devices used in industrial control systems.
5. Categorize the function of output devices used in industrial control systems.
6. Describe the function of programmable controller interface devices, processors, and programming devices.
7. Describe the number systems and codes used in programmable controller programming.
8. Design basic logic ladder diagram programs.

Lab

1. Connect a programmable controller to an electromechanical system.
2. Develop a programmable controller program flow chart.
3. Program a programmable controller to perform a specific function.
4. Troubleshoot programmable controller connections.
5. Troubleshoot programmable controller programs.

Course Content Outline:

Lecture

1. Introduction
   1. History of the control of process machines and driven equipment in industry
   2. Solid state devices -- analog versus digital
   3. Robots versus programmable controls
   4. Electro-mechanical "hard-wired" systems versus programmable controller systems
   5. Required skills for mechanical, and electrical/electronic technicians
2. Process Machines and Driven Equipment in Today's Industry
   1. Types of processes
   2. Types of driven equipment
   3. Demand for quick modification and/or changeover
   4. Power requirements
   5. Control requirements
   6. Need for simplified troubleshooting
3. Electrical Circuits
   1. Alternating current (AC) power and power distribution
   2. Direct current (DC) power and power sources/transformers
   3. Series, parallel and combination circuits
4. Control devices used in industry -- input device versus output device
5. Wiring requirements and electrical codes

4. Industrial Control -- Input Devices
   1. Switches
   2. Latching relays -- start/stop switches
   3. Sensors
   4. Timers -- time delay relays
   5. Counters
   6. Analog input -- analog transducers
   7. Other

5. Industrial Controls -- Output Devices
   1. Motors
   2. Motor starters
   3. Relays
   4. Valves
   5. Indicator lights
   6. Analog output
   7. Other

6. Control Diagrams
   1. One-line power/control diagrams
      1. Components
      2. Symbols
   2. Ladder diagrams
      1. Components
      2. Symbols

7. Control of Process Machines and Driven Equipment Using Solid State Devices -- Parts of a programmable logic controller (PLC) system
   1. Interface devices
      1. Input sections
      2. Output sections
      3. Analog/digital (A/D) modules
   2. Processors -- Central Processing Units (CPU)
      1. Types
      2. Construction -- integrated circuitry
      3. Memory -- organization/size/categories
      4. Logic -- gates/diagrams
      5. Numbering systems -- decimal/hexadecimal/binary
      6. Boolean operations -- truth tables
      7. Logic ladder diagram programs
   3. Programming devices
      1. Purpose
      2. Types
      3. Software

8. Specific Programmable Logic Controller Applications
   1. Process machines
      1. Food industry
2. Manufacturing industry
3. Electronics industry
4. Assembly plants

2. Driven Equipment
   1. Food industry
   2. Manufacturing industry
   3. Electronics industry
   4. Assembly plants

Lab

1. Connecting a programmable controller to an electromechanical system.
2. Programming a programmable controller to perform a specific function.
3. Troubleshooting programmable controller connections.
4. Troubleshooting programmable controller programs.

Methods of Instruction:
Lab, Lecture:

Methods of Evaluation:
Exams/Tests/Quizzes
Problem Solving
Skill Demonstrations

Exams

Typical Assignments:

Reading:
Schematics for electronic circuits Text readings Flow charts

Writing, Problem Solving or Performance:
Connect a programmable controller to a mechanical or pneumatic system. Program a programmable controller to perform a specific function.

Other:

Required Materials Examples:
Book 1

Author: Jon Stenerson

Title: Fundamentals of Programmable Logic Controllers, Sensors, and Communications

Publication Date: 2005
Edition: 3rd
Publisher: Prentice
Course Preparation:
Prerequisite(s): None
Co-Requisite(s): ESYST 101
Recommended: None