CNC Technical Solutions Inc.

CNC Technical Solutions - Phase 2 Industrial Controls Course Outline

Phase 2 – Industrial Controls

Classroom and Lab Hours – Combined 136 total hours.
Typical method of delivery – 1 day of class per week, 8 hours a day. Instructor led, combined classroom and lab delivery.

Phase 2 – Industrial Controls is an instructor led class which will introduce Industrial Control applications in a typical manufacturing or other environment. Theory, implementation, and practical review of Programmable Logic Controls (PLC) and their associated devices and systems will be the basis of this class. CNCTS has designed tabletop simulators of the manufacturing process that will be used as a lab trainer to assist learning, theory and practical application of PLC systems.

There is a textbook and study guide used for this class that will cover the following areas;

- Introduction to Programmable Controllers
- Number Systems and Codes
- Logic Concepts
- Processors, the Power Supply, and Programming Devices
- •The Memory System and I/O Interaction
- The Discrete Input/Output System
- The Analog Input/Output System
- Special Function I/O and Serial Communication Interfacing
- Programming Languages
- System Programming and Implementation
- PLC System Documentation
- PLC Start-Up and Maintenance

PLC Theory/Fundamentals & PLC Soft Simulator Debug

This is an instructor lead class, which will cover the theory, implementation, and practical review of Programmable Logic Controls (PLC) and their associated devices and systems. Students will design and debug a virtual PLC control system using a PC based Software System Simulator. Students will begin to understand the complex nature of PLC systems, controller assembly, production and integrated within the manufacturing environment. This class will introduce

students to the complex integration of all systems which essentially run the modern advanced manufacturing environment.

This is a pre-requisite class for Phase 3 Advanced Control Systems.

Electrical Print Review, Panel build/Test and Practical Applications

The student will learn how to interpret and properly read electrical diagrams for each print reviewed. The student will be provided a real-world electrical diagram for a Machine Tool, Manufacturing Plant or Factory for this lab. Working with other students, they will be provided a small-scale machine tool electrical enclosure or MTEC and a corresponding print set. The student will now be required to read the print set then physically wire and troubleshoot the panel for proper operation. This highly interactive model of learning begins to incorporate working in tandem with another student, not unlike the typical setting in a manufacturing environment where teamwork is critical to achieving success.

This class is designed to expose the students to the techniques and math behind wire sizing, properly sizing conduit, mathematically creating angles and making proper bends in EMT Conduit. Also included is determining the number of physical conductors required to add electrical hardware between control panels, color codes, fusing and over current protection. PLC System Documentation and PLC Start-Up and maintenance are critical components of the class. Students will work in cooperation to convert the MTEC magnetic relay logic control wiring into PLC wiring and finally the magnetic control logic will be converted to PLC logic.

PLC Practical Application and Troubleshooting

The practical application and troubleshooting component of this class is a highly interactive model that has been designed to maximize the students PLC & troubleshooting Skills. The centerpiece for this class is CNCTS designed miniature scale automation system. This system has been designed to replicate a multi-station conveyor with a fully functional part handling automation system complete with a gantry pick & place including an error checking sort station all using open loop motor controls and an AB PLC control system. This technology has been painstakingly designed and miniaturized by CNCTS to replicate this widely used factory technology in a 16” by 16” desktop footprint.

CNCTS has received a US patent for the design of its automated miniature scale training simulators.

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Anticipated Learning Outcomes

Upon completion of Phase 2 - Industrial Controls the student will achieve the following Learning Outcomes:

- Understand PLC's, ladder logic, field devices and the concepts that make up a PLC system.
- Comprehend electrical drawings and their function on the automation simulator.
- Comprehend the sequence of operation theory and sequence outline.
- Be proficient in the use of test equipment used in the troubleshooting of PLC systems.
- Comprehend PLC Logic, Sequence of operation theory and sequence outlines.
- Laptop/cabling & the use of industrial software (PC to PLC communications using RS Logics).
- Be proficient in the logical debug and troubleshooting of PLC systems (Basic to intermediate level).