Revised: Summer 2024

Virginia Western Community College
IND 250
Introduction to Basic Computer Integrated Manufacturing

Prerequisites

MTH 111 (Not Intended for Transfer) -Provides a foundation in mathematics with emphasis in arithmetic, unit conversion, basic algebra, geometry and trigonometry. This course is intended for CTE programs.

ETR 113 (Not Intended for Transfer) -Studies DC and AC circuits, basic electrical components, instruments, network theorems, and techniques used to predict, analyze and measure electrical quantities.

Corequisites

MTH 131- Teaches Newton's laws, resultants and equilibrium of force systems, trusses and frames, determination of centroids, and distributed loads and moments of inertia. Introduces dry friction and force systems in space.

Course Description

Presents basic principles used in the design and implementation in a computer integrated manufacturing system. Emphasizes team concept and all aspects of a computer integrated manufacturing system to include the following: Robotics, Conveyor Control, Machining Center Integration Quality Control, Statistical Quality Control, and Computer Integrated Manufacturing (CIM) software.

Semester Credits: 3 Lecture Hours: 1 Lab Hours: 4

Required Materials

Textbook:
Programmable Logic Controllers, Hardware and Programming 5th Edition by Max Raibee. Goodheart and Wilcox, ISBN 978-1-64925-986-8

Lab Manual for Programmable Logic Controllers, Hardware and Programming 4th Edition by Max Raibee. Goodheart and Wilcox, ISBN 978-1-64925-987-5

Software:
All software is provided on lab computers

Other Required Materials:
None

Course Outcomes

At the completion of this course, successful students will be able to

- Identify the role of robotics in an assembly work cell.
- Understand conveyor control as a part of a digital assembly cell.
- Analyze and troubleshoot relay logic diagrams.
- Understand all the necessary symbols to create a relay logic schematic.
- Translate Relay Logic into Program Logic for the PLC.
- Create Ladder Logic programs in Allen Bradley RSLogix.
- Identify the major parts of the PLC and how to select the proper PLC for the task.
- Program functions of a specific PLC memory area.
- Understand digital logic symbols and truth tables.
- Simplify ladder logic diagrams using Karnaugh and Quine-McCluskey Techniques
- Use Structured Data Types like Counters and Timers in ladder logic programming.
- Program Ladder Logic using Connected Components Workbench (RS Logix5000) and Siemens Step7
- Identify the differences between tag types.
- Create and troubleshoot other PLC programming languages, structured text and function block.
- Acquire data and display I/O trends in RSLogix.
- Use PLC Math functions for advanced programming.
- Define and implement PROFIBUS in a Step 7 and AB RSLogix project and connect specific PROFIBUS modules to the bus system.
- Troubleshoot network communication regardless of transfer protocol.
- Wire and assemble a functioning trainer system to perform a given task.
- Present a working project to an audience.

Topical Description

- Relay Logic Overview
- Transformers
- Ohms Law
- Transistor Relay Sourcing and Sinking Terminology
- Digital vs Analog I/O
- Digital Inputs and Outputs
- Relay Logic Symbols
- Drawing a Relay Logic Program
- Introduction to RSLogix (Addressing in the PLC)
- Introduction to PLC structure
- Writing a ladder logic program in RSlogix
- Bits, Bytes and Words

- Alternative numbering systems (BCD, Binary, Octal, Hexadecimal, Gray Code)
- Data types in RSLogiX
- Digital Logic Gates
- Boolean Algebra
- Karnaugh maps and Quine McCluskey Techniques
- PLC wiring
- PLC communication using USB, Profinet, or Ethernet
- PLC Math functions
- Structured Data (Timers and Counters)
- Data plotting and acquisition
- Structured Text
- Function Block
- Project assembly and presentation

Notes to Instructors

Beginning Fall 2020, VWCC will require students to have a computer or reliable access to a computer, capable of participation in an online format. Online courses at Virginia Western require a significant amount of interaction with Canvas, the Learning Management System, and many require real-time class sessions using the Zoom web-conferencing tool. To be successful in online classes, students must have substantial access to a computer with hi-speed internet connectivity. The expected requirements are listed on the college webpage.

Allen-Bradly and Siemens software is installed on laboratory laptops for use by students in class.

The final exam in this class is a team presentation of a functioning PLC project. The project rubric includes, function of physical system, wiring organization, programming structure and presentation to the class.

ADA Statement (PDF)
Title IX Statement (PDF)