Virginia Western Community College
IND 251
Introduction to Basic Computer Integrated Manufacturing

Prerequisites

IND 250 - (Not Intended for Transfer) Presents basic principles used in the design and implementation of 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.

Corequisites

none.

Course Description

Presents basic principles used in the design and implementation in manufacturing work cells. Includes selection of the robot system, worksite, application cell sensors, development of cycle times, and economic analysis.

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

Required Materials

Textbook:
Instructor Developed

Software:
RSLogix Connected Components Workbench (most recent version)
CMore HMI software (most recent version)
Siemens TIA Portal (version purchased by school)
Emerson Proficy (most recent version)
Cognex Vision Suite (installed version on lab computers)
FESTO Process Control (most recent)

Other Required Materials:
None

Course Outcomes

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

- Operate, assemble, and interconnect microcontrollers.
- Use microcontrollers in a mechatronic system to expedite automation systems.
- Program mechatronic modules and systems.
- Understand a variety of digital and analog sensors and how to select the appropriate sensor for the application.
- Use sensors as inputs to a PLC (AB and Siemens)
- Compare and Contrast PLC programming languages (Function Block Diagram, GRAFCET, Structured Text, Sequential Function Chart and Ladder Logic)
- Program an HMI
- Use HMI to interface with PLC.
- Familiarization with P&ID symbology
- Draw P&I diagrams for basic process control systems.
- Setup and use Vision Systems for interrogation of parts.
- Use vision systems as inputs to PLCs.
- Understand vision system controls and possible applications.
- Analyze basic process control systems using level, flow, mixing and pressure setpoints.
- Understand the basics of a process control loop.
- Understand the effects of Proportional, Derivative and Integral gains on a controlled process.
- Tune a working system using common PID tuning techniques.

Topical Description

- Analog Sensors
- Analog Sensor scaling for physical parameters
- Digital Sensors
- Ladder Logic programming using Tags
- Instruction Blocks and advanced Tags
- Function Block programming
- GRAFCET programming
- Structured Text Programming
- Siemens TIA portal programming
- Human Machine Interfaces
- Programming a Human Machine Interface
- Networking for HMI and PLC communication
- Vision System overview
- Vision System Calibration
- Vision System I/O
- Liquid Level Control Loop
- Pressure Control Loop
- Liquid Flow Control Loop

- Temperature Control Loop
- PID tuning.
- P&I Diagrams
- Schematics drawing
- Troubleshooting

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.

A NC3 certification in Sensor Fundamentals will be offered in class.

A NC3 certification in PLC Fundamentals will be offered in class.

ADA Statement (PDF)
Title IX Statement (PDF)