Miami Dade College

Course Competencies Template - Form 112

GENERAL INFORMATION	
Name:	Phone #:
Course Prefix/Number: EST 3543C	Course Title: Programmable Logic Controllers
Number of Credits: 4	
Degree Type	☐ B.A. ☐ B.S. ☐ B.A.S ☐ A.A. ☐ A.S. ☐ A.A.S. ☐ C.C.C. ☐ A.T.C. ☐ V.C.C
Date Submitted/Revised: 03-05-2008	Effective Year/Term: 2009-2
☒ New Course Competency ☐ Revised Course Competency	
Course to be designated as a General Education course (part of the 36 hours of A.A. Gen. Ed. coursework): ☐ Yes ☒ No	
The above course links to the following Learning Outcomes: ☐ Communication ☒ Numbers / Data ☒ Critical thinking ☐ Information Literacy ☐ Cultural / Global Perspective ☐ Social Responsibility ☐ Ethical Issues ☒ Computer / Technology Usage ☐ Aesthetic / Creative Activities ☐ Environmental Responsibility	
Course Description (limit to 50 words or less, **must correspond with course description on Form 102**): This course is designed to provide students with the skills to design, operate, and test PLC systems. Students learn logic fundamentals, programming technologies, integrated circuits, and number systems as applied to PLC technology. Prerequisite: CET2123C. Laboratory fee. (2 hr. lecture; 4 hr. lab)	
Prerequisite(s): CET2123C	Co requisite(s):

Course Competencies:

Competency 1: The student will demonstrate an understanding of the principles of programmable logic controllers (PLCs) by:

1. Defining what a PLC is and explaining how and where it is used.
2. Defining terminology used in connection with programmable logic controls.
3. Explaining the purpose and function of relays, pushbuttons, limit switches, analog/digital converters, and other basic control devices.
4. Identifying the main hardware components of a PLC, describing their functions, and explaining how they work together.
5. Describing the differences between PLC and relay logic and listing the advantages of PLC over relay logic.
6. Identifying the software components of a PLC and describing their functions.

Competency 2: The student will demonstrate the ability to interpret ladder logic by:

1. Drawing the logic symbol, constructing a truth table, and stating the Boolean expression for the AND, OR, and NOT functions.

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2. Identifying common NEMA (National Electrical Manufacturers Association) schematic symbols and the functions that they describe.
3. Defining the program elements of ladder logic and explaining the functions that they perform, including contacts, coils, and data functions, and common ladder logic arrangements.
4. Reading and interpreting ladder logic diagrams for specified control jobs.

Competency 3: The student will demonstrate how to apply ladder logic given a real world scenario by:

1. Opening sample code.
2. Interpreting the sample code by describing what operations it is designed to perform.
3. Writing modifications to the code in order to reprogram the controller to meet given requirements.
4. Testing the code to ensure that it performs according to specifications.
5. Documenting the newly edited code.

Competency 4: The student will demonstrate a basic understanding of how to program microcontrollers by:

1. Identifying a PLC's system components and their addresses.
2. Converting a relay ladder schematic into ladder logic programming.
3. Identifying types of documentation required and explaining why documentation is critical.
4. Using simulation software to write addressing instructions.
5. Using simulation software to write branch instructions.
6. Using simulation software to write up/down counting instructions.
7. Writing instructions to initialize system counters/timers.

Competency 5: The student will demonstrate an understanding of how to set up and operate the Allen-Bradley PLC simulator by:

1. Installing the simulation software.
2. Navigating the PLC simulator program menus and screen commands.
3. Initiating the control process.
4. Running a demonstration program.

Competency 6: The student will demonstrate an understanding of how switches are used for analog control by:

1. Interpreting schematics that utilize NEMA symbols.
2. Defining the operating requirements for the switch.
3. Converting the switch schematic into ladder logic code.
4. Executing an application using simulation software to activate a load.

Competency 6: The student will demonstrate an understanding of analog control and the relationship between PLCs and proportional integral devices (PID) by:

1. Describing how PLCs implement proportional, integral, and derivative process control.
2. Listing and explaining hardware for PID control.
3. Describing typical field devices connected to PID modules.
4. Explaining how PID algorithms are configured in PLC software.
5. Identifying other configuration functions available for analog control.
6. Describing the execution of a typical PID program.

Competency 7: The student will demonstrate how to apply compare instructions, data manipulation instructions, and control instructions given a real world scenario by:

1. Defining compare instructions, data manipulation, and control instructions.
2. Explaining how and when each type of instruction is used.

3. Opening sample code.
4. Interpreting the sample code by describing what operations it is designed to perform.
5. Writing modifications to the code in order to reprogram the controller to meet given requirements.

Competency 8: The student will demonstrate the ability to troubleshoot PLC problems by:

1. Defining PLC enclosures, identifying factors that adversely affect proper operation, such as dust, humidity, temperature, etc., and describing how to install them properly.
2. Identifying sources of Electrical noise (EMI) and how to reduce the effects of EMI.
3. Defining leaky inputs/outputs and explaining how to correct them with a bleeder resistor.
4. Explaining NEC (National Electric Code) grounding requirements.
5. Explaining voltage variations and surges and describing preventative measures.
6. Listing the preventative maintenance tasks and scheduling required for optimal system function.
7. Discussing how to connect a personal computer and a PLC to establish communications between them.