Miami Dade College

Course Competencies Template – Form 112

GENERAL INFORMATION	
Course Prefix/Number: EST2542C	Course Title: Programmable Logic Controllers 1
Number of Credits: 3	
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: 09-05-2007	Effective Year/Term: 2007-2
☒ New Course Competency ☐ Revised Course Competency	
General Education courses must align with the General Education Outcomes. The above course links to the following outcome(s): ☒ Communication ☒ Numbers / Data ☒ Critical thinking ☒ Formulation of strategies ☐ Cultural / Global Perspective ☐ Social Responsibility ☐ Ethical Issues ☒ Computer / Technology Usage ☐ Aesthetic / Creative Activities ☐ Environmental Responsibility	
Course Description (limit to 50 words or less): This first course in programmable logic controllers (PLC), is designed for students preparing for careers in electronics, manufacturing, electrical or industrial technology. Students learn the basic operational concepts common to PLCs, focusing on PLC principles, programming, numbering systems, data manipulation, math and sequencer instructions. Pre/corequisite: EET1141C. A.S. degree credit only. (2 hr. lecture, 2 hr. lab)	
Prerequisite(s): EET1141C	Corequisite(s):

Course Competencies: (for further instruction/guidelines go to: http://www.mdc.edu/asa/curriculum.asp)

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.

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7. Describing the general classes and types of PLC memory devices.
8. Listing and describing the different types of PLC peripheral support devices.

Competency 2: The student will demonstrate the ability to define and apply numbering systems to codes and arithmetic operations by:

1. Explaining the difference between the decimal and binary numbering systems.
2. Using the binary number system to count, add, subtract, multiply, and divide and perform decimal-to-binary and binary-to-decimal conversions.
3. Representing binary numbers in DC and AC systems.
4. Using the octal system to count and perform decimal-to-octal, octal-to-decimal, binary-to-octal, and octal-to-binary conversions.
5. Using the hexadecimal system to count and perform conversions to and from decimal, binary, and octal systems.
6. Using negative numbers and complements in any number system to perform addition using the 1-, 2-, 9-, and 10- complements.

Competency 3: The student will demonstrate an understanding of basic logic circuits by:

1. Explaining what a logic gate is and how it is used.
2. Identifying the types of logic gates, including AND, OR, NOT, EXOR.
3. Identifying types of logic gates and their truth tables.
4. Troubleshooting logic circuits.
5. Identifying types of adder/subtractor logic circuits.
6. Constructing adder/subtractor logic circuits.
7. Troubleshooting adder/subtractor logic circuits.
8. Solving problems using diode logic gates, transistor logic gates, and magnetic core logic gates.
9. Describing the operation, uses, and applications of monostable and astable multivibrators.

Competency 4: The student will demonstrate an understanding of flip-flops, registers, and counters by:

1. Explaining the purpose of a/d (analog to digital) converters.
2. Describing the types of input signals generated by analog field devices.
3. Explaining the functions of a data highway.
4. Comparing the operation of D latches and D flip-flops by using timing diagrams.
5. Describing the difference between pulse-triggered and edge-triggered flip-flops.

6. Explaining the theory of operation of master-slave devices.
7. Connecting IC J-K flip-flops as toggle and D flip-flops.
8. Identifying types of registers and counters.
9. Constructing registers and counters using flip-flops.
10. Describing the wave-shaping capability and operating characteristics of Schmitt trigger ICs.

Competency 5: 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.
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 6: The student will demonstrate a basic understanding of how to program micro-controllers 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.