JEFFERSON COLLEGE
COURSE SYLLABUS

ETI263
PLCs FOR AUTOMATION
4 Credit Hours

Prepared by:
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ETI263 PLCs for Automation

I. CATALOGUE DESCRIPTION

A. Pre-requisite: ETI236 Industrial Control

B. 4 Credit Hour Award

C. PLCs for Automation is a study of programmable logic controllers (PLCs); their hardware components and programming methods. Basic and advanced programming procedures are studied and applied. Safe installation and troubleshooting practices are studied and applied. Process control, data acquisition and computer-controlled machines and processes are also studied. (S)

II. EXPECTED LEARNING OUTCOMES/CORRESPONDING ASSESSMENT MEASURES

<table>
<thead>
<tr>
<th>Demonstrate knowledge of safety measures that must be followed when installing, using and servicing programmable logic controllers</th>
<th>Written Exams, Quizzes, Observation of Lab Performance</th>
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<tr>
<td>Demonstrate knowledge of how the programmable logic controller fits into the automation and the industrial process</td>
<td>Written Exams, Quizzes, Observation of Lab Performance</td>
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<td>Demonstrate knowledge of the component make-up of a functional programmable logic controller</td>
<td>Written Exams, Quizzes, Observation of Lab Performance</td>
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<td>Demonstrate the ability to use proper ladder logic programming methods</td>
<td>Written Exams, Quizzes, Observation of Lab Performance</td>
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<td>Demonstrate the ability to use several advanced programming instructions, such as timers, counters, and sub-routines</td>
<td>Written Exams, Quizzes, Observation of Lab Performance</td>
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<td>Demonstrate knowledge of system start-up and troubleshooting procedures</td>
<td>Written Exams, Quizzes, Observation of Lab Performance</td>
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III. OUTLINE OF TOPICS

A. Unit 1 Programmable Logic Controllers (PLCs)
   1. Define what a programmable logic controller (PLC) is and list its advantages over relay systems
   2. Identify the main parts of a PLC and describe their functions
   3. Outline the basic sequence of operations for a PLC
   4. Identify the general classifications of PLCs
B. Unit 2 PLC Hardware Components
1. List and describe the function of the hardware components used in PLC systems
2. Describe the basic circuitry and applications for discrete and analog I/O modules, and interpret typical I/O and CPU specifications
3. Explain I/O addressing
4. Describe the general classes and types of PLC memory devices
5. List and describe the different types of PLC peripheral support devices available

C. Unit 3 Fundamentals of Logic
1. Describe the binary concept and function of gates
2. Construct circuits from Boolean expressions and derive Boolean equations for given logic circuits
3. Convert relay ladder schematics to ladder logic programs
4. Develop elementary programs based on logic gate functions

D. Unit 4 Basics of PLC Programming
1. Define and identify the functions of a PLC memory map
2. Describe the PLC program scan sequence
3. Understand how ladder diagram languages, Boolean language, and function chart programming language are used to communicate information to the PLC
4. Define and identify the function of internal relay instructions
5. Identify the common operating modes found in PLCs
6. Write and enter ladder logic programs

E. Unit 5 Developing Fundamental PLC Wiring Diagrams and Ladder Logic Programs
1. Identify the functions of electromagnetic control relays, contactors, and motor starters
2. Identify switches and sensors commonly found in PLC installations
3. Explain the operation of output control devices commonly found in PLC installations
4. Describe the operation of an electromagnetic latching relay and the PLC-programmed LATCH/UNLATCH instruction
5. Convert fundamental relay ladder diagrams to PLC ladder logic programs
6. Write PLC programs directly from a narrative description
F. Unit 6 Programming Timers
1. Describe the operation of on-delay and off-delay timers
2. Differentiate between a non-retentive and retentive timer
3. Convert fundamental timer relay schematic diagrams to PLC ladder programs
4. Analyze and interpret typical PLC timer ladder logic programs

G. Unit 7 Programming Counters
1. List and describe the functions of PLC counter instructions
2. Describe the operating principle of a one-shot or transitional contact
3. Analyze and interpret typical PLC counter ladder logic programs
4. Apply the PLC counter function to a ladder logic program

H. Unit 8 Installation and Troubleshooting PLC systems and programs
1. Outline and describe requirements for a PLC enclosure
2. Identify and describe noise reduction techniques
3. Describe proper grounding practices and preventive maintenance tasks associated with PLC systems
4. List and describe specific PLC troubleshooting procedures

IV. METHOD(S) OF INSTRUCTION
A. Lecture
B. Programming Activities using the Logix Pro PLC Simulator Software
C. PLC Circuit Design Exercises
D. Textbook Reading

V. REQUIRED TEXTBOOK(S)
Petruzella, *Programmable Logic Controllers*, (current edition)

VI. REQUIRED MATERIALS
USB flash drive

VII. SUPPLEMENTAL REFERENCES
None
VIII. METHOD OF EVALUATION

A. Homework 20%
B. Programming Exercises 20%
C. Exams 50%
D. Attendance 10%

A = 90-100%
B = 80-90%
C = 70-80%
D = 60-70%
F = Below 60%

IX. ADA AA STATEMENT

Any student requiring special accommodations should inform the instructor and the Coordinator of Disability Support Services (Library; phone 636-797-3169).

X. ACADEMIC HONESTY STATEMENT

All students are responsible for complying with campus policies as stated in the Student Handbook (see College Website http://www.jeffco.edu).

XI. ATTENDANCE STATEMENT

Regular and punctual attendance is expected of all students. Any one of these four options may result in the student being removed from the class and an administrative withdrawal being processed: (1) Student fails to begin class; (2) Student ceases participation for at least two consecutive weeks; (3) Student misses 15 percent or more of the coursework; and/or (4) Student misses 15 percent or more of the course as defined by the instructor. Students earn their financial aid by regularly attending and actively participating in their coursework. If a student does not actively participate, he/she may have to return financial aid funds. Consult the College Catalog or a Student Financial Services representative for more details.

XII. OUTSIDE OF CLASS ACADEMICALLY RELATED ACTIVITIES

The U.S. Department of Education mandates that students be made aware of expectations regarding coursework to be completed outside the classroom. Students are expected to spend substantial time outside of class meetings engaging in academically related activities such as reading, studying, and completing assignments. Specifically, time spent on academically related activities outside of class combined with time spent in class meetings is expected to be a minimum of 37.5 hours over the duration of the term for each credit hour.