I. **OVERVIEW**

The following information will appear in the 2009 - 2010 catalog

**ELTEC 232** *Introduction to Programmable Logic Controllers* 2 Units

*Also offered as:* CMPET - 232: Introduction to Programmable Logic  
*Formerly listed as:* ELTEC - 232: Introduction to Programmable Logic

Introduction to the basic concepts of Programmable Logic Controllers. Installation, programming, maintaining, and trouble shooting of micro-sized programmable logic controller systems. **This course is approved by the state of California for the DAS Electrician Trainee Program. Field trips are not required. Course is applicable to the associate degree.**

II. **LEARNING CONTEXT**

Given the following learning context, the student who satisfactorily completes this course should be able to achieve the goals specified in Section III, Desired Learning:

A. **COURSE CONTENT**

1. **Required Content:**

The Content listed below is presented in a fashion that provides an equal amount of classtime to each topic. Lectures on these topics provide student's with the foundation to perform hands-on laboratories through out the term.

   a. Hardware and components  
   b. Number systems and codes  
   c. Fundamentals of controller programming logic  
   d. Programmable Logic Controller programming  
   e. Wiring diagrams and ladder programs  
   f. Programming timers and counters  
   g. Program control instructions  
   h. Data manipulation and math instructions  
   i. Fault diagnosis and correction  
   j. Transducer operation and signal conditioning  
   k. Controller system design  
   l. System installation, maintenance, and operation

2. **Required Lab Content:**

The Content listed below is presented in a fashion that correlates with lecture to provide students...
with hands-on laboratory skills in the operation and use of Programmable Logic Controllers.

a. Hardware and components  
b. Number systems and codes  
c. Programmable Logic Controller programming  
d. Programming timers and counters  
e. Program control instructions  
f. Data manipulation and math instructions  
g. Fault diagnosis and correction  
h. Transducer operation and signal conditioning  
i. System installation, maintenance, and operation

B. HOURS AND UNITS

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<th>INST METHOD</th>
<th>TERM HOURS</th>
<th>UNITS</th>
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<tr>
<td>Lect</td>
<td>18.00</td>
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<tr>
<td>Lab</td>
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C. METHODS OF INSTRUCTION (TYPICAL)

Instructors of the course might conduct the course using the following method:

1. Related material will be presented by means of class lecture and laboratory demonstrations
2. Additional studies will be required from technical manuals specific to course topics
3. Laboratory exercises using controller components and test instrumentation that provides hands-on familiarity with course topics
4. Students demonstrate mastery of topic by utilizing instrumentation to diagnose proper operation of completed laboratory exercises.
5. Each student is required to provide written responses to basic and comprehensive problems associated with the course content
6. Each student is required to write, trouble shoot and test controller programs that demonstrate principles related to the course topics
7. Each student is required to provide a written assessment of the completed laboratory work and must interpret the results obtained
8. Each student is required to integrate the course principles in a comprehensive manner that demonstrates mastery of the subject material

D. ASSIGNMENTS (TYPICAL)

1. EVIDENCE OF APPROPRIATE WORKLOAD FOR COURSE UNITS

Time spent on coursework in addition to hours of instruction (lecture hours)
Weekly Chapter Reading Assignments

a. Assigned reading of technical manuals
b. Student reading, review and preparation for lab assignments

2. **EVIDENCE OF CRITICAL THINKING**
   
   **Assignments require the appropriate level of critical thinking**

1. Using Timer and Counter Instructions, write a program that will increment a Counter every minute. After the Counter reaches a value of 30 minutes, turn on Output 011. Input 102 will reset the Counter.

2. Address 868 is a first scan bit. Once the PLC is powered up, how many false to true transitions of Input 101 will occur before the Status bit 901 will be true (on)?

   ____________.

3. Input 103 is momentarily pressed. Next, Input 101 has 3 false to true transitions and finally Input 102 has 4 false to true transitions. What is the accumulated value of Counter 901? ____________

3. Describe when Counter 901 Status bit will be true (on).

E. **TEXTS AND OTHER READINGS (TYPICAL)**


III. **DESIRED LEARNING**

A. **COURSE GOAL**
   
   *As a result of satisfactory completion of this course, the student should be prepared to:*

   (1) to identify from schematics and properly use common PLC logic devices such as contacts, timers, (2) and counters write and demonstrate a simple PLC program to accomplish a given logic task.

B. **STUDENT LEARNING GOALS**
   
   *Mastery of the following learning goals will enable the student to achieve the overall course goal.*

1. **Required Learning Goals**
   
   *Upon satisfactory completion of this course, the student will be able to:*

   a. Identify and describe the basic hardware for microsized Programmable Logic Controllers
b. Explain binary concepts and Boolean algebra used in Programmable Logic Controllers
c. Identify the basics of Programmable Logic Controller programming and be able to write Ladder Programs using both a hand-held programmer and a dedicated personal computer
d. Identify the use of and be able to apply programming timers, counters, control instructions, and sequencer instructions in developing a useful Programmable Logic Controller program
e. Describe the basic design and operation of transducers used in conjunction with Programmable Logic Controllers and be able to identify signal conditioning necessary for such transducers
f. Design and install a micro-sized Programmable Logic Controller system including input and output devices

2. **Lab Learning Goals**

   *Upon satisfactory completion of the lab portion of this course, the student will be able to:*

   a. Design and install a micro-sized Programmable Logic Controller system including input and output devices

   b. Demonstrate methods for proper installation and maintenance of Programmable Logic Controllers

   c. Logically investigate and determine the location of faults in Programmable Logic Controllers and be able to identify signal conditioning necessary for such transducers

   d. Apply number systems and codes used in Programmable Logic Controllers

IV. **METHODS OF ASSESSMENT (TYPICAL)**

   A. **FORMATIVE ASSESSMENT**

   1. Classroom programming and logic assignments

   2. Student quality of work and ability to work efficiently during labs.

   3. Lab unit quizzes

   B. **SUMMATIVE ASSESSMENT**

   1. Mid Term and Final Exams

   2. Written documentation and evaluation of results during laboratory exercises.