

# APEL 128: PROGRAMMABLE LOGIC CONTROLLERS; LOW-VOLTAGE SYSTEMS & HIGH-VOLTAGE SYSTEMS

## Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2021
Units:	4
Hours:	24 lecture, 72 laboratory per quarter (96 total per quarter)
Prerequisite:	Per California Code of Regulations, this course is limited to students admitted to the Electrical Apprenticeship Program.
Advisory:	Not open to students with credit in APRT 128.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	None
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable

## Student Learning Outcomes

- A successful student will be able to identify fire alarm equipment.
- A successful student will be able to explain a fire alarm system.
- A successful student will be able to explain fire alarm circuits.
- A successful student will be able to demonstrate the use of methods for installing a fire alarm system.

## Description

Introduction to programmable controllers, alarm systems, telephone wiring, instrumentation, and high voltage testing.

## Course Objectives

The student will be able to:

- Explain programmable controllers.
- Describe and appraise alarm systems.
- Use instrumentation fundamentals.
- Explain basic telephone wiring.
- Illustrate and explain high voltage testing and safety.

## Course Content

- Programmable logic controllers
  - Numbering systems
  - Operation
  - Input and output modules
  - Logic and ladder logic programming
  - Processors and date organization
  - Relay logic instructions
  - Timers and counters

- Data manipulating and control
  - Sequencers and shift registers
  - Documenting PLCC systems
- Alarm systems
    - Basic systems
    - Advanced technology systems
    - Installation, maintenance, and troubleshooting
    - Fire alarm codes and standards
- Instrumentation
    - Fundamentals
    - Calibration
    - Flow
    - Pressure
    - Level
    - Temperature
    - Control valves
    - Pneumatics
    - Controllers
- Basic telephone wiring
    - Safety codex
    - TIA/EIA standards and codes
    - Pathways and spaces
    - System architecture
    - Unshielded twisted pair
- High voltage
    - Testing
    - Safety
    - Using a megohmmeter

## Lab Content

- Students will properly wire a fire alarm system.
- Student will draw a control diagram and build it in the lab.

## Special Facilities and/or Equipment

Laboratory with electrical tools and equipment.

## Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

- Results of written quizzes and average of six tests
- Results of hands-on projects and homework
- Results of class participation
- Maintenance of a student's workbook with questions drawn from text

## Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

- Lecture
- Lab assignments
- Group discussion
- Class demonstrations

## Representative Text(s) and Other Materials

National Joint Apprenticeship and Training Committee for the Electrical Industry. Student Workbook-A4SWK. 2011.

National Joint Apprenticeship and Training Committee for the Electrical Industry. Digital Electronics. 2011.

Herman, Stephen L., and Walter N. Alerich. Industrial Motor Control. 2011.

Brumbach, Michael E.. Electronic Variable Speed Drives. 2010.

Herman, Stephen L.. Standard Textbook of Electricity. 2011.

National Fire Protection Association. National Electrical Code. 2017.

These are the standard Electrical textbooks/workbooks used for this course. Although one or more may not be within 5 years of the required published date, they are the most current books used when teaching this course.

## **Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments**

- A. Read the complete publication: Electronic Variable Speed Drives by Delmar Publishers.
- B. Read Chapters 1-5 on Programmable Logic Controllers in the National Joint Apprenticeship and Training Committee (NJATC) Electrical Industry Workbook.
- C. Prepare a basic alarm system diagram.
- D. Prepare a basic telephone wiring diagram.

## **Discipline(s)**

Electricity