

APEL 128A: NEC REVIEW, ELECTRIC VEHICLE POWER TRANSFER SYSTEMS, ADVANCED LIGHTING CONTROLS

Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2025
Units:	6
Hours:	60 lecture, 36 laboratory per quarter (96 total per quarter)
Prerequisite:	Per California Code of Regulations, this course is limited to students admitted to the San Francisco Inside Wireman Electrical Program.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	None
Grade Type:	Letter Grade Only
Repeatability:	Not Repeatable

Student Learning Outcomes

- A student will be able to apply the National Electric Code to EV vehicle power transfer systems and install lighting controls systems to meet National Electric Code and Title 24 requirements.
- A student will be able to navigate the National Electric Code for the California Electrician State Exam.

Description

Students will apply National Electric Code (NEC) calculations related to electrical installations and practice NEC navigation skills. Students will be trained on electric vehicle transfer systems' function, installation, and code requirements. They will learn lighting control system fundamentals, install and troubleshoot advanced lighting control systems, and learn Title 24 energy savings code requirements related to lighting.

Course Objectives

The student will be able to:

1. Demonstrate efficient navigation of the National Electric Code (NEC) in preparation for the California Electricians State Certification Exam.
2. Apply NEC calculations to determine component sizing requirements in electrical installations.
3. Demonstrate awareness of the various terminologies (terms) used throughout the electric vehicle (EV) industry to describe equipment used to supply energy to charge EV batteries.
4. Contrast the difference between the types of EVs, including HEV, PHEV, and BEV.
5. Explain the advantages of each of the three types of EVs.
6. Assess the charging equipment requirements for commercial/ industrial electric vehicles.

7. Describe the difference between AC electric vehicle supply equipment (EVSE) and DC electric vehicle charging equipment.
8. Define the variables that determine the required charge time for an EV.
9. Describe the various types and sizes of DC charging equipment available in the marketplace.
10. Understand the AC voltage and current requirements of DC charging equipment for proper service load calculations.
11. Identify specific Code requirements for EVSE equipment and installations.
12. Distinguish between AC Level 1, Level 2, and DC fast charge system wiring and characteristics.
13. Describe the benefits of conducting a site visit by a contractor or their representative.
14. Demonstrate awareness of specific municipal and utility requirements for the installation of EV service equipment.
15. Critique the installation of EV charging equipment for proper installation.
16. Identify common issues with electric vehicle charging equipment (EVCE).
17. Utilize the electric vehicle supply equipment (EVSE) for troubleshooting and repair flowcharts in the repair of EVCE.
18. Demonstrate the ability to navigate Title 24 California Energy Saving Code Part 6 regarding lighting control installations.
19. Demonstrate the ability to read lighting control system prints.
20. Describe advanced lighting control system technology application and function.
21. Differentiate between the lighting control system installation practices using manufacturers' data and instructions.
22. Demonstrate the ability to accurately install and troubleshoot lighting control system components in a laboratory setting.

Course Content

1. National Electric Code (NEC) review
 - a. National Electric Code navigation in preparation for the California State Electrical Certification test
 - b. National Electric Code calculation practice
2. Electric vehicle power transfer systems
 - a. Introduction to electric vehicles
 - b. Electric vehicle charging equipment
 - c. The National Electric Code as it applies to electric vehicle installations
 - d. Advanced load calculations
 - e. Site assessment
 - f. Commissioning
 - g. Troubleshooting
 - h. Code supplement
3. Advanced lighting controls
 - a. Title 24 California Energy Saving Code Part 6
 - b. Advanced lighting control print reading
 - c. Lighting control technology application and function
 - d. Introduction to various lighting control systems and their components, including N-Light, Wattstopper, and Lutron systems
 - e. Lighting control system installation

Lab Content

Students will use safety, job management, and material management skills to complete projects in the lab.

1. Lighting control system installation and troubleshooting.

Special Facilities and/or Equipment

1. Lighting control laboratory with electrical tools and equipment.
2. Computer and overhead projector.
3. When taught via Foothill Global Access, on-going access to computer with software and hardware capable of running video conferencing applications (e.g., Zoom).

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
Laboratory assignments
Group discussion
Demonstration

Representative Text(s) and Other Materials

Electrical Training Alliance. Code Calculations Based on the 2023 NEC. 2023.

Miller, Charles R.. Illustrated Guide to the National Electric Code Based on the 2023 NEC. 2023.

NFPA. NFPA 70: National Electrical Code. 2023.

Protech Skills Learning Management System courses: Electric Vehicle Charging Systems (EVCS-17), 2nd ed.

California Energy Code Title 24 Part 6.

Instructor handouts; manufacturers' instructions and specification sheets.

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

Complete Lesson 1 in the Protech Learning Management System course titled Electric Vehicle Charging Systems (EVCS-17), 2nd ed.

Discipline(s)

Electricity