APEL 123: AC THEORY; TRANSFORMERS; INTERMEDIATE NATIONAL ELECTRICAL CODE

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 123.
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 explain how and why transformers are used.
- A student will be able to explain the dangers of transformers.
- A student will be able to perform mathematical calculations for sizing a transformer.
- A student will be able to lay out wire sizes for a transformer.

Description

Study of AC theory, transformer fundamental design and function. Expanded study of the National Electrical Code. Students will learn the fundamentals of AC theory and how it relates to transformer design. They will also learn to understand how National Electrical Codes are applied for the safe and proper installation of transformers.

Course Objectives

The student will be able to:
A. Explain AC circuits from basic resistance through impedance and power factor.
B. Analyze and describe transformer design and function.
C. Discuss and explain how to use the National Electrical Code book.

Course Content

A. AC theory
1. Terms associated with AC theory
2. Currents and voltages for components and circuits
3. Current and voltage sine waves to demonstrate phase relationships
4. Maximum, effective (rms), average and peak to peak voltage and current
5. Inductance
6. Capacitance
B. Transformer design and function
1. Types of transformers
2. Main purpose of transformers
3. Proper wiring and installation of transformers
C. Use of the National Electric Code
1. Selection of conductors
2. Why some materials are better conductors or insulators than others
3. Effect of heat on insulators
4. Sizing and typing of conductors
5. Conductor installation techniques
6. Code requirements to circuits and loads for lighting, appliance, heating and service entrance
7. Conductor ampacity
8. Feeders
9. Branch circuits
10. Lighting and receptacles
11. Wiring methods

Lab Content

A. Students will demonstrate the proper safety techniques in the testing of voltage, current and power.
B. Students will demonstrate the proper installation of different type of transformers.
C. Students will use the National Electric Code book to determine the proper sizing of conductors, raceways and grounding requirements.

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

Clayton, Gregory. AC Theory, 3rd ed.. 2011.

Jones and Bartlett Learning. Electrical Safety-Related Work Practices, 3rd ed.. 2014.

Mazur, G.A.. Test Instruments Applications Manual. 2006.

National Joint Apprenticeship and Training Committee. Syllabus for Second Year Core Curriculum. 2014.

National Joint Apprenticeship and Training Committee. AC Theory Student Workbook. 2010.

National Joint Apprenticeship and Training Committee. Blueprints Student Workbook. 2005.

National Joint Apprenticeship and Training Committee. Code and Practices -2 Student Workbook. 2014.

National Joint Apprenticeship and Training Committee. Code Calculations Student Workbook. 2014.

National Joint Apprenticeship and Training Committee. Codeology Student Workbook. 2014.

National Joint Apprenticeship and Training Committee. Electrical Safety-Related WP Workbook. 2013.

National Joint Apprenticeship and Training Committee. Transformer Student Workbook. 2007.

National Joint Apprenticeship and Training Committee. Applied Codeology Navigating the NEC. 2014.

National Joint Apprenticeship and Training Committee. Code Calculations. 2014.

Sheehan, J.V.. Blueprint Reading for Electricians, 3rd ed.. 2010.

Taylor, O.. Transformer: Principles and Applications. 2006.

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 chapter 6-10 in the course textbook, AC Theory (3rd ed).
B. Prepare an electrical diagram using the principles of Ohm's Law.
C. Prepare a list of the various types of transformers used in AC circuits.

Discipline(s)

Electricity