

PALOMAR COLLEGE  
COURSE OUTLINE OF RECORD FOR  
DEGREE CREDIT COURSE

  X   Transfer course     X   A.A. degree applicable course

(check all that apply)

**COURSE NUMBER AND TITLE:** AP E 104 Transformers and Code  
Calculations, Conduit Bending and  
Blueprints

**UNIT VALUE:** 4

**MINIMUM NUMBER OF SEMESTER HOURS:** 96

**BASIC SKILLS REQUIREMENTS:**

Appropriate language and computational skills.

**ENTRANCE REQUIREMENTS**

**PREREQUISITE:** Apprenticeship Electrician 103

**COREQUISITE:** None.

**RECOMMENDED PREPARATION:** None.

**SCOPE OF COURSE:**

Study of transformers theory, installation, connection and distribution systems. Performing short circuit calculations, selecting of building wire for specific applications, calculating loads for residential and multifamily loads and service feeders. Applying conduit bending principles using mechanical benders to fabricate segmented concentric bends.

**SPECIFIC COURSE OBJECTIVES:**

The student will be able to:

1. Apply principles of blueprint reading to interpret residential and commercial blueprints and specifications.
2. Investigate transformer principles and demonstrate his/her knowledge by making various types of transformer connections.

3. Apply conduit-bending principles on mechanical and hydraulic benders in the fabrication of segmented bends.
4. Perform calculations for proper sizing of service feeders and also specify the appropriate size wire and fittings to effect and installation in conformance with the NEC.
5. Perform short circuit calculations and anticipate overload amperage for selection of appropriate fuses and circuit breakers.
6. Students will use voltmeters, ammeters, and multimeters in testing for circuit parameters - (resistance current voltage).

**CONTENT IN TERMS OF SPECIFIC BODY OF KNOWLEDGE:**

- I. Blueprint Reading
  - A. Residential
  - B. Commercial
  - C. Residential Circuiting
  - D. Commercial Specifications
  - E. Cost Awareness
- II. Transformers
  - A. Fundamental Concepts
  - B. Connections
  - C. Installations
  - D. Distribution Systems
- III. Conduit Bending
  - A. Ratchet Type Benders
  - B. Segment Bending
  - C. Concentric Bending
  - D. Wiring Methods
- IV. Code Calculations
  - A. Short Circuit Calculations
  - B. Sizing Building Wire
  - C. Component Protection
  - D. Conductor Ampacity
  - E. Residential Loads
  - F. Multifamily Loads
- V. Test Instruments and Cabling
  - A. Voltmeters, Megohmmeters, Ammeters
  - B. Application, Measurement and Safety
  - C. DC Meters and AC Meters

**REQUIRED READING:**

Applied Codeology. Upper Marlboro, MD: National Electrical Contractors Association, 1996.

Cadick, John and AVO Multi-Amp Institute. Cables and Wiring. Albany, NY: Delmar Publishers, Inc., 1993.

Cox, Richard A. Electricians Guide to Conduit Bending. Spokane, Washington: Pend Orielle, 1982.

Electrical Protection Handbook. St. Louis: Bussman Cooper Industries, 1992.

Hart, George V. Ugly's Electrical References. Houston: United Printing Arts, Inc., 1986.

Herman, Stephen L. Delmar's Standard Textbook of Electricity. Albany, NY: Delmar Publishers, Inc., 1995.

IBEW Constitution. Washington: International Brotherhood of Electrical Workers, 1992.

Lloyd, Richard E. Electrical Raceways and Other Wiring Methods. Albany, New York: Delmar Publishers, Inc., 1996.

Local 569 IBEW. Local Union By-Laws. 1991.

Mathematics Essential for NJATC Courses. Upper Marlboro, MD: National Joint Apprenticeship and Training Committee, 1994.

National Electrical Code. Quincy, Mass: National Fire Protection Association, 1996.

NJATC Blueprint Reading. Upper Marlboro, MD: National Joint Apprenticeship and Training Committee, 1993.

NJATC Code Calculations. Upper Marlboro, MD: National Joint Apprenticeship and Training Committee, 1996.

NJATC Central Office Commercial Print Set. Upper Marlboro, MD: National Joint Apprenticeship and Training Committee, 1993.

Second Year Student Workbook. Upper Marlboro, MD: National Joint Apprenticeship and Training Committee, 1995.

Shultz, George Patrick. Transformers and Motors. Carmel, Indiana: Sams, Div. Of Prentice Hall Publishing, 1995.

**SUGGESTED READING:**

Croft T., and W. Summers. American Electrician Handbook. New York: McGraw-Hill, 1987.

National Electrical Code Handbook. Quincy, Mass: National Fire Protection Association, 1992.

**REQUIRED WRITING:**

Completion of written assignments in student workbook which are at least one paragraph in length.

**OUTSIDE ASSIGNMENTS:**

**Students are expected to spend a minimum of three hours per unit per week in class and on outside assignments, prorated for short term classes.**

Outside assignments include completion of reading assignments, student workbook applications and attendance at union and JATC meetings as required.

**INSTRUCTIONAL METHODOLOGY:**

**Check all that apply:**

- lecture
- laboratory
- lecture-laboratory combination
- directed study

**This course may be offered as a distance education course and meets Title 5 regulations 55370, 55372, 55374, 55376, 55378, and 55380. Yes  No**

**If yes, check all that apply.** (See guidelines for preparation for definitions.)

- telecourse
- mediated instruction
- computer assisted instruction

**GRADING POLICY AND STANDARDS** (include methods of determining whether the stated objectives have been met by students):

5%	Workbook	A = 100 - 90
10%	Participation	B = 89 - 83
70%	Unit exams	C = 82 - 75
15%	Final exam	F = 74 and below

**IS COURSE REPEATABLE FOR REASON(S) OTHER THAN DEFICIENT GRADE?**

Yes  No  Number of times course may be taken for credit:

If yes, identify specific provision of Title 5 Division 2 section(s) 55761-55763 and 58161 which qualifies course as repeatable: 58161 Part C IIA

**CONTACT PERSON:** Director, Vocational Programs, Ext. 2286