

# APPROVED CURRICULUM FOR GENERAL ELECTRICIAN CERTIFICATION PROGRAM

CAC CURRICULUM ITEM	San Joaquin Delta College	COURSE(S) ID	COURSE TITLE	LEC	LAB
<b>I. SAFETY</b>					
I-A. General jobsite safety awareness					
1) Why safety is important		ELEC 38	OSHA Standards for Construction	x	
2) Key factors involved with safe work practices		ELEC 38	OSHA Standards for Construction	x	
3) Develop a respect for electricity		ELEC 38	OSHA Standards for Construction	x	
a) be aware of dangers of shock		ELEC 38	OSHA Standards for Construction	x	
b) describe locations of potential shock hazards		ELEC 38	OSHA Standards for Construction	x	
c) demonstrate use of no contact voltage indicators and other devices to determine if the system is energized		ELEC 38	OSHA Standards for Construction	x	
d) demonstrate techniques for working on energized circuits		ELEC 38	OSHA Standards for Construction	x	
4) Hazards created by poor housekeeping on the job		ELEC 38	OSHA Standards for Construction	x	
5) Maintain safe work area and tools		ELEC 38	OSHA Standards for Construction	x	
6) Be aware of the dangers of falling objects		ELEC 38	OSHA Standards for Construction	x	
7) Respect and obey job safety rules		ELEC 38	OSHA Standards for Construction	x	
I-B. Emergency procedures					
1) First aid training and CPR					
I-C. Compliance with OSHA and EPA regulations					
1) Attend and/or conduct regular safety meeting		ELEC 38	OSHA Standards for Const.	x	
2) General OSHA requirements on the jobsite		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
3) The guidelines for OSHA Assured Grounding and GFI usage		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
4) Use of material safety data sheets (MSDS) to identify and properly handle hazardous materials (e.g. cleaning fluids, transformer oils)		ELEC 31	ELECTRICAL WIRING METHODS	x	x
		ELEC 38	OSHA Standards for Const.	x	
		ELEC 33	INDUSTRIAL WIRING METHODS	x	x
I-D. Substance abuse					
<b>II. TOOLS, MATERIALS AND HANDLING</b>					
II-A. Proper tool management					
1) Identify common hand and power tools		ELEC 33	INDUSTRIAL WIRING METHODS	x	x
2) Proper selection and application of hand tools		ELEC 33	INDUSTRIAL WIRING METHODS	x	x
3) Proper selection and application of power tools		ELEC 33	INDUSTRIAL WIRING METHODS	x	x
4) Proper care for tools		ELEC 33	INDUSTRIAL WIRING METHODS	x	x
5) Safe techniques for using ladders		ELEC 33	INDUSTRIAL WIRING METHODS	x	x
6) Defects that make tools unsafe for use		ELEC 31	ELECTRICAL WIRING METHODS	x	x
7) Use of meters to take readings		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
II-B. Proper rigging methods					
1) Proper knots		ELEC 38	OSHA Standards for Const (OSHA cert 36 hrs.)	x	
2) Proper techniques for rigging and hoisting		ELEC 38	OSHA Standards for Const (OSHA cert 36 hrs.)	x	
3) Safe capacities for lifting arrangements		ELEC 38	OSHA Standards for Const (OSHA cert 36 hrs.)	x	
II-C. Proper digging techniques					
1) Depth and shape of holes for supporting poles		ELEC 38	OSHA Standards for Const (OSHA cert 36 hrs.)	x	
2) Proper techniques for digging, grading and leveling trenches for the installation of ducts		ELEC 38	OSHA Standards for Const (OSHA cert 36 hrs.)	x	
II-D. Proper use of motorized tools (use of platform lifts, bucket trucks, and truck mounted cranes)					
		ELEC 38	OSHA Standards for Const (OSHA cert 36 hrs.)	x	
II-E. Proper material management					
1) Identify commonly used materials by name		ELEC 38	OSHA Standards for Const (OSHA cert 36 hrs.)	x	
2) Proper selection and application of materials		ELEC 38	OSHA Standards for Const (OSHA cert 36 hrs.)	x	
<b>III. MATH</b>					
III-A. Appropriate mathematical calculations to solve for unknowns					
1) Arithmetic operators		MATH 80	ELEMENTARY ALGEBRA	x	
2) Solving word problems		MATH 80	ELEMENTARY ALGEBRA	x	
3) Problems involving fractions		MATH 80	ELEMENTARY ALGEBRA	x	
4) Reducing fractions to lowest terms		MATH 80	ELEMENTARY ALGEBRA	x	
5) Converting decimals to fractions and back		MATH 80	ELEMENTARY ALGEBRA	x	
6) Angles and sides of triangles		MATH 80	ELEMENTARY ALGEBRA	x	
7) Unknown angles and sides of a triangle		MATH 80	ELEMENTARY ALGEBRA	x	
8) Metric prefixes and converting different prefixes		MATH 80	ELEMENTARY ALGEBRA	x	
9) Using powers of ten to perform math functions		MATH 80	ELEMENTARY ALGEBRA	x	
10) Converting from english to metric measuring systems		MATH 80	ELEMENTARY ALGEBRA	x	
11) Algebraic formulas		MATH 80	ELEMENTARY ALGEBRA	x	
12) Square roots		MATH 80	ELEMENTARY ALGEBRA	x	
13) Ratio, percentage, and proportion		MATH 80	ELEMENTARY ALGEBRA	x	
14) Problems using direct and inverse relationships		MATH 80	ELEMENTARY ALGEBRA	x	
<b>IV. ELECTRICAL THEORY</b>					
IV-A. Basic electrical theory					
1) Define terms, units of measure		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x

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2) Electron flow		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
3) Producing electrical current		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
4) Products (effects of electrical current)		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
IV-B. Ohm's Law, Kirchoff's Laws, Lenz's Law, Thevenin's and Norton's Theorems		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
IV-C. Series circuits					
1) Components		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
2) Resistance of circuits		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
3) Total resistance		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
4) Effects of changing voltage and resistance		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
5) Law of proportion for series voltage divider circuits		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
6) Power used in circuits		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
a) by components		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
b) Wasted power		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
IV-D. Parallel circuits					
1) Components		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
2) Differences between series and parallel circuits		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
3) Ohm's Law		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
4) Circuits		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
5) Total resistance using product-sum and reciprocal methods		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
6) Alternate current paths		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
7) Currents		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
8) Law of proportion		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
9) Power requirements of components		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
IV-E. Combination circuits					
1) Combination circuits		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
2) Components		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
3) Equivalent resistance		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
4) Alternate current paths		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
5) Ohm's Law		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
6) Power use and dissipation		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
IV-F. Characteristics of voltages in circuits					
1) Polarity and flow of electrons		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
2) Distribution and voltage drops		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
3) Proper wire size needed to lower losses		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
IV-G. Characteristics of magnetism/electromagnetism		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
IV-H. Theory of superposition and solving for multiple voltage sources circuits		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
IV-I. Operation and characteristics of three wire systems		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
IV-J. Operation and characteristics of three phase systems					
1) Identify differences between 3 wire single phase and three phase circuits		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
2) Voltage drop and power loss		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
IV-K. AC Theory					
1) Terms associated with ac theory		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
2) Currents and voltages for components and circuits		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
3) Conductor sizes using NEC		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
4) Current and voltage sine waves to demonstrate phase relationships		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
5) Maximum, effective (rms), average, and peak to peak voltage and current		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
6) Inductance		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
a) Factors that effect inductance		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
b) Behavior of current when inductance is present		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
c) Relationship between current, applied voltage and counter-electromotive force		ELEC 30	FUNDAMENTALS OF ELECTRICITY	x	x
7) Capacitance		ELEC 30,32	FUNDAMENTALS OF ELECTRICIT /ELECTRICAL MOTORS	x	x
a) Effects on circuits with capacitance		ELEC 30,32	FUNDAMENTALS OF ELECTRICIT /ELECTRICAL MOTORS	x	x
b) Capacitance, capacitive reactance, and frequency		ELEC 30,32	FUNDAMENTALS OF ELECTRICIT /ELECTRICAL MOTORS	x	x
8) Relationships and behaviors of series RL, parallel RL, series RC, parallel RC, series LC, parallel LC, series RLC, parallel RCL circuits		ELEC 30,32	FUNDAMENTALS OF ELECTRICIT /ELECTRICAL MOTORS	x	x
9) Function, operation and characteristics or rectifiers		ELEC 30,32	FUNDAMENTALS OF ELECTRICIT /ELECTRICAL MOTORS	x	x
a) Actions of full wave and half wave rectifiers		ELEC 30,32	FUNDAMENTALS OF ELECTRICIT /ELECTRICAL MOTORS	x	x
b) Schematics		ELEC 30,32	FUNDAMENTALS OF ELECTRICIT /ELECTRICAL MOTORS	x	x
10) Series resonance, parallel resonance and circuits		ELEC 30,32	FUNDAMENTALS OF ELECTRICIT /ELECTRICAL MOTORS	x	x
11) Filters		ELEC 30,32	FUNDAMENTALS OF ELECTRICIT /ELECTRICAL MOTORS	x	x
12) Power Factor		ELEC 30,32	FUNDAMENTALS OF ELECTRICIT /ELECTRICAL MOTORS	x	x
a) Watts, vars, and volt-amperes		ELEC 30,32	FUNDAMENTALS OF ELECTRICIT /ELECTRICAL MOTORS	x	x
b) Reactive power		ELEC 30,32	FUNDAMENTALS OF ELECTRICIT /ELECTRICAL MOTORS	x	x

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c) Proper placement of power factor correction capacitors		ELEC 30,32	FUNDAMENTALS OF ELECTRICITY /ELECTRICAL MOTORS	x	x
d) Procedure to recognize and correct poor power factor arrangements		ELEC 30,32	FUNDAMENTALS OF ELECTRICITY /ELECTRICAL MOTORS	x	x
13) Power quality issues		ELEC 30,32	FUNDAMENTALS OF ELECTRICITY /ELECTRICAL MOTORS	x	x
a) Causes of poor power quality		ELEC 30,32	FUNDAMENTALS OF ELECTRICITY /ELECTRICAL MOTORS	x	x
b) The effect of harmonics		ELEC 30,32	FUNDAMENTALS OF ELECTRICITY /ELECTRICAL MOTORS	x	x
c) Locating harmonics through observation and test equipment		ELEC 30,32	FUNDAMENTALS OF ELECTRICITY /ELECTRICAL MOTORS	x	x
d) Techniques to reduce and eliminate effects and harmonics		ELEC 30,32	FUNDAMENTALS OF ELECTRICITY /ELECTRICAL MOTORS	x	x
IV-L. Use of electronics					
1) Electron Flow through solid state components		ELECT 15L, 20	SOLID STATE BASIC ELECTRICITY / ELECTRONICS	x	x
2) Precautions against electrostatic discharges around semi-conductor devices		ELECT 15L, 20	SOLID STATE BASIC ELECTRICITY / ELECTRONICS	x	x
3) Functions, operation and characteristics of diodes and zener diodes		ELECT 15L, 20	SOLID STATE BASIC ELECTRICITY / ELECTRONICS	x	x
a) characteristic curves		ELECT 15L, 20	SOLID STATE BASIC ELECTRICITY / ELECTRONICS	x	x
b) testing procedures		ELECT 15L, 20	SOLID STATE BASIC ELECTRICITY / ELECTRONICS	x	x
c) schematics including diodes		ELECT 15L, 20	SOLID STATE BASIC ELECTRICITY / ELECTRONICS	x	x
4) Functions, operation and characteristics of transducers		ELECT 15L, 20	SOLID STATE BASIC ELECTRICITY / ELECTRONICS	x	x
a) operation of transducers		ELECT 15L, 20	SOLID STATE BASIC ELECTRICITY / ELECTRONICS	x	x
b) schematics including transducers		ELECT 15L, 20	SOLID STATE BASIC ELECTRICITY / ELECTRONICS	x	x
5) Functions, operation and characteristics of various types of transistors (diacs, triacs, SCR's, etc.)		ELECT 15L, 20	SOLID STATE BASIC ELECTRICITY / ELECTRONICS	x	x
a) operation of transistors		ELECT 15L, 20	SOLID STATE BASIC ELECTRICITY / ELECTRONICS	x	x
b) current and voltage values		ELECT 15L, 20	SOLID STATE BASIC ELECTRICITY / ELECTRONICS	x	x
c) testing procedures		ELECT 15L, 20	SOLID STATE BASIC ELECTRICITY / ELECTRONICS	x	x
d) schematics including transistors		ELECT 15L, 20	SOLID STATE BASIC ELECTRICITY / ELECTRONICS	x	x
6) Functions, operations, and characteristics and circuit configurations of amplifiers		ELECT 15L, 20	SOLID STATE BASIC ELECTRICITY / ELECTRONICS	x	x
a) basic circuit configurations for various types of amplifiers		ELECT 15L, 20	SOLID STATE BASIC ELECTRICITY / ELECTRONICS	x	x
7) Functions, operations and characteristics of integrated circuits (IC's)		ELECT 15N	INTRO PLC / DIGITAL CIRCUITS	x	x
a) schematics of and including IC's		ELECT 15M	INTRO PLC / DIGITAL CIRCUITS	x	x
b) information on data sheets for integrated circuits		ELECT 15N	INTRO PLC / DIGITAL CIRCUITS	x	x
8) Functions, operations and characteristics of three main categories of photo-operated devices		ELECT 15M	INTRO PLC / DIGITAL CIRCUITS	x	x
9) Digital logic circuits		ELECT 15N	INTRO PLC / DIGITAL CIRCUITS	x	x
a) terms associated with digital logic circuits		ELECT 15M	INTRO PLC / DIGITAL CIRCUITS	x	x
b) Types of circuits		ELECT 15N	INTRO PLC / DIGITAL CIRCUITS	x	x
c) The operative symbols for AND, OR, NOT operations		ELECT 15M	INTRO PLC / DIGITAL CIRCUITS	x	x
d) the use of Boolean algebra equations, laws operations, and theorems		ELECT 15N	INTRO PLC / DIGITAL CIRCUITS	x	x
e) truth tables		ELECT 15M	INTRO PLC / DIGITAL CIRCUITS	x	x
f) gate functions and gate circuits		ELECT 15N	INTRO PLC / DIGITAL CIRCUITS	x	x
g) BUFFER and INVERTER amplifiers and accompanying truth tables		ELECT 15M	INTRO PLC / DIGITAL CIRCUITS	x	x
h) operation and characteristics of NAND, and NOR logic accompanying truth tables		ELECT 15N	INTRO PLC / DIGITAL CIRCUITS	x	x
i) operation and characteristics of XOR and X NOR logic and accompanying truth tables		ELECT 15M	INTRO PLC / DIGITAL CIRCUITS	x	x
j) positive and negative logic and its effect on gate operation		ELECT 15N	INTRO PLC / DIGITAL CIRCUITS	x	x
k) digital logic equivalent circuits		ELECT 15M	INTRO PLC / DIGITAL CIRCUITS	x	x
l) various optoelectric devices		ELECT 15N	INTRO PLC / DIGITAL CIRCUITS	x	x
<b>V. CODE REQUIREMENTS</b>					
V-A. National Electrical Code and local code					
1) Purpose and intent of electrical codes		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
2) Scope on NEC and local codes		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
3) How local codes may differ from local codes		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x

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4) Utilizing code book		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
a) mandatory rules		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
b) fine print rules		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
c) "neat and workmanlike"		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
d) locate definitions		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
e) interpretations		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
f) recognize and use exceptions		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
g) materials recognized by the NEC		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
h) identify code markings		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
i) distinguish wet, damp, and dry locations		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
j) determine if specific installations are acceptable to the code		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
k) requirements for special occupancies		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
l) answer specific questions		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
5) Use NEC to calculate various conductors and fill situations		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
a) service conductors		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
b) permissible loads on various circuits		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
c) allowable cable tray fills		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
d) imparity of various conductor and fill situations		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
e) imparity of various circuits and load types		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
f) overload protection for motors, equipment and phase converters		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
g) minimum ampacity for motor disconnect means		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
h) horsepower ratings for motors and disconnecting means		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
i) grounding requirements		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
6) Use NEC for hazardous locations		ELEC 33	Industrial Wiring Methods	X	X
a) hazardous locations by class		ELEC 33	Industrial Wiring Methods	X	X
b) equipment and wiring methods necessary for particular hazardous locations		ELEC 33	Industrial Wiring Methods	X	X

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<b>VI. CONDUCTORS</b>					
VI-A. Various types of conductors					
1) Types of conductors and insulators		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
2) Why some materials are better conductors or insulators than others		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
3) Effect of heat on insulators		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
4) Sizing and typing of conductors		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
a) Use better symbols to identify insulator types		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
b) Use American wire gauge chart		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
c) Convert inches, mils, square mils, and circular mils from one to the other		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
5) Differences between aluminum and copper conductors		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
6) Properties of high voltage cables		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
7) Effects of soil conditions on underground cables		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
VI-B. Conductor installation techniques					
1) Different wiring methods for particular conductors and situations		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
a) Wire connectors		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
b) Types, installation, limitations		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
2) Different methods of installing conductors in conduits, raceways and cable trays		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
a) Problems which may be encountered		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
b) maximum tension allowed		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
c) Use of pulling machines to assist in installation of conductors		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
3) Proper splicing methods and techniques for various conductors and locations		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
VI-C. Methods for selecting conductors					
1) Using code to determine type of conductor to use in a particular situation		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
2) Using mathematical calculations to determine current carrying capacity of conductors		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
3) Calculating or selecting cable ampacity from N.E.C. tables		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
4) Loads for sizing conductors		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
5) Code requirements depending on type of circuits and loads (lighting, appliance, heating, service entrance)		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
VI-D. Cable fault situations					
1) The types and causes of cable faults		ELEC. 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
2) Methods and equipment for locating cable faults including terminal tracing and magnetic detection		ELEC. 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
<b>VII. CONDUIT, RACEWAYS, PANELBOARDS AND SWITCHBOARDS</b>					
VII-A. Terms associated with conduits and raceways					
		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
VII-B. Conduit and wiring support systems recognized by code					
1) Select appropriate conduit type		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
2) Select and utilize appropriate connectors		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
3) Select and utilize appropriate fastening devices and reinforcements		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
4) Special considerations		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
VII-C. Procedures for laying out various types of bends					
1) Take-up and gain		ELEC 31	ELECTRICAL WIRING METHODS	X	X
2) Kicks and offsets		ELEC 31	ELECTRICAL WIRING METHODS	X	X
3) Calculate degrees		ELEC 31	ELECTRICAL WIRING METHODS	X	X
4) Back-to-back bends		ELEC 31	ELECTRICAL WIRING METHODS	X	X
5) Determine overall length of conduit for specific situations		ELEC 31	ELECTRICAL WIRING METHODS	X	X
6) Locating bending points		ELEC 31	ELECTRICAL WIRING METHODS	X	X
7) Four techniques for segment bending		ELEC 31	ELECTRICAL WIRING METHODS	X	X
8) Techniques and operations for making concentric bends		ELEC 31	ELECTRICAL WIRING METHODS	X	X
9) Radius of a circle		ELEC 31	ELECTRICAL WIRING METHODS	X	X
VII-D. Procedures for making bends when fabricating conduits					
1) Hand benders to make small bends on small diameter conduit		ELEC 31	ELECTRICAL WIRING METHODS	X	X
2) Power benders to make bends on larger diameter conduit		ELEC 31	ELECTRICAL WIRING METHODS	X	X

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a) Make offsets using "constants" or "shrink" methods		ELEC 31	ELECTRICAL WIRING METHODS	x	x
b) Make bends in proper sequence, direction and with necessary accuracy		ELEC 31,33	INDUSTRIAL WIRING METHODS	x	x
VII-E. Fabricating raceways and wiring support systems		ELEC 31	ELECTRICAL WIRING METHODS	x	x
VII-F. Cable assembly wiring methods recognized by the N.E.C.		ELEC 31	ELECTRICAL WIRING METHODS	x	x
VII-G. Function, operation and requirements for various panelboards and switchgear					
1) Installation of panels		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
2) Installation of components		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
3) Wiring and connectors		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
4) Special considerations and occupancies		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
<b>VIII. LIGHTING SYSTEMS</b>					
VIII-A. Function, operation and characteristics of various lighting systems					
1) Incandescent		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
2) Fluorescent		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
3) High Intensity Discharge		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
4) Low voltage		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
VIII-B. Lighting distribution and layout		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
VIII-C. Installation and connection of fixtures		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
<b>IX. OVERCURRENT DEVICES</b>					
IX-A. Function, operation and characteristics of overcurrent protection devices					
1) Purpose and location of devices		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
2) Three considerations necessary for the electrical component		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
3) Interrupting ratings		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
4) Short circuit currents		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
5) Overload and overcurrent situations		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
6) 10 and 25 foot tap rules		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
7) Operation and application of fuses		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
a) Single element and time delay		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
b) The effects of heat		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
8) Operation and application of various types of circuit breakers (e.g. molded case, air break)		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
9) Utilize Peak-Let-Thru charts and table		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
10) Function, operation and characteristics of ground fault circuit interrupters		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
11) Function, operation and characteristics of surge protectors		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
12) Appropriate devices for situation and according to code		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x

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CAC CURRICULUM ITEM	San Joaquin Delta College	COURSE(S) ID	COURSE TITLE	LEC	LAB
<b>X. GROUNDING SYSTEMS</b>					
X-A. Functions, operation and characteristics of grounding systems					
1) Reasons for grounding		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
2) General types of faults		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
3) Grounding electrode systems		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
X-B. Sizing, layout and installation of grounding systems					
1) N.E.C. requirements and interpretations		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
2) Size of conductors and electrodes		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
3) Installation of electrodes		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
4) Installation of conductors and connection to electrodes		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
5) The impact of soil conditions on earth grounding systems and procedures of earth resistance testing		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
6) Principles and procedures of earth resistance testing		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
7) Determine when ground fault protection is required		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
X-C. Difference between insulation, isolation and elevation					
		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
X-D. Difference between grounding, grounded, and bonding					
		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
X-E. Special circumstances					
1) Systems over 1,000 volts		ELEC 33	INDUSTRIAL WIRING METHODS	X	X
2) Separately derived systems		ELEC 33	INDUSTRIAL WIRING METHODS	X	X
3) Buildings sharing service		ELEC 33	INDUSTRIAL WIRING METHODS	X	X
<b>XI. PRINTS AND SPECIFICATIONS</b>					
XI-A. Creation of blueprints, plans, and specifications					
1) Utilize symbols used in electrical and related trades		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
2) Recognize functions of basic line types		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
3) Identify drawing tools and techniques		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
a) Orthographic views		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
b) Types of projections		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
c) Drafting scales		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
4) Recognize and apply dimensions		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
5) Prepare "as built" drawings		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
6) Differences between wiring diagrams, line diagrams, schematics, and ladder diagrams		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
a) Given schematics complete wiring diagrams		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
b) Given panels and equipment layouts create drawings showing conduits and conductors using appropriate scale		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
XI-B. Use of blueprints, plans, and specifications					
		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
1) Recognize function of various types of plots, sections, details, schedules, specification sheets, addendums and revisions		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
2) Determine devices, locations, quantities, feeds, conduit types and sizes and conductor sizes		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
a) Parts of the electrical service		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
b) Identifying special purpose outlets and the loads they serve		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
c) Completing take-off sheets for ordering material		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
d) Determine costs for jobs		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
e) How costs affect jobs		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
3) Interpret non-electrical dimensions and considerations		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
4) Relationships between architectural considerations and electrical installations		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
5) Correlate information from other trades plans with electrical plans to determine potential conflicts		ELEC 31,33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X

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CAC CURRICULUM ITEM	San Joaquin Delta College	COURSE(S) ID	COURSE TITLE	LEC	LAB
<b>XII. MOTORS, MOTOR CONTROLLERS AND PROCESS CONTROLLERS</b>					
XII-A. Function, operation and characteristics of various types of motors (AC, DC, dual voltage repulsion, universal, 3 phase, squirrel cage, synchronous)					
1) Physical parts of various motors		ELEC 32	Electrical Motors	X	X
2) Utilize information sheets, plans, schematics, and motor nameplates to gain information		ELEC 32	Electrical Motors	X	X
3) Motor Losses		ELEC 32	Electrical Motors	X	X
4) Starting and operating characteristics		ELEC 32	Electrical Motors	X	X
5) Methods to identify windings in DC motor		ELEC 32	Electrical Motors	X	X
6) Means for providing field failure, current limit, voltage and speed control		ELEC 32	Electrical Motors	X	X
7) Block diagrams to demonstrate power supplies, armature, field and control features		ELEC 32	Electrical Motors	X	X
8) Torque, locked rotor current, no-load speed, and slip		ELEC 32	Electrical Motors	X	X
9) Reasons for low voltage starting		ELEC 32	Electrical Motors	X	X
10) Function, operation and characteristics of stepping motors		ELEC 32	Electrical Motors	X	X
XII-B. Proper techniques for motor installations					
1) Necessary calculations for electrical requirements per code		ELEC 32	Electrical Motors	X	X
2) Correct power factor		ELEC 32	Electrical Motors	X	X
3) Proper wire type and size		ELEC 32	Electrical Motors	X	X
4) Appropriate connections		ELEC 32	Electrical Motors	X	X
5) How various motors can be made to run at a different speed or direction		ELEC 32	Electrical Motors	X	X
a) Schematics		ELEC 32	Electrical Motors	X	X
b) Connections top reverse or change direction		ELEC 32	Electrical Motors	X	X
XII-C. Function, operation and characteristics of motor controllers, circuits and devices					
1) Ways and means of starting and stopping motors		ELEC 32	Electrical Motors	X	X
2) Operation of a magnetic coil		ELEC 32	Electrical Motors	X	X
3) Use of magnetic starters and controllers		ELEC 32	Electrical Motors	X	X
4) Correct sizing of magnetic starters and controllers		ELEC 32	Electrical Motors	X	X
5) Difference between starters and contactors		ELEC 32	Electrical Motors	X	X
6) Function, operation, and characteristics of overload protective devices		ELEC 32	Electrical Motors	X	X
7) Schematics for various control circuits		ELEC 32	Electrical Motors	X	X
8) Two-wire control		ELEC 32	Electrical Motors	X	X
9) Three-wire control circuits		ELEC 32	Electrical Motors	X	X
10) Interlocking methods		ELEC 32	Electrical Motors	X	X
11) Reversing and sequential controllers		ELEC 32	Electrical Motors	X	X
12) Jogging, inching, plugging		ELEC 32	Electrical Motors	X	X
13) Multiple start-stop controls and selector switches		ELEC 32	Electrical Motors	X	X
14) Phase failure relays		ELEC 32	Electrical Motors	X	X
15) Various manual and automatic speed control techniques		ELEC 32	Electrical Motors	X	X
16) Function, operation, and characteristics of variable frequency drive systems		ELEC 32	Electrical Motors	X	X
17) Function, operation, characteristics and installation procedures, programmable logic controllers		ELEC 32	Electrical Motors	X	X
a) Function of central processing unit		ELEC 32	Electrical Motors	X	X
b) Memory types and sizes		ELEC 32	Electrical Motors	X	X
c) User and storage memory		ELEC 32	Electrical Motors	X	X
d) Back-up batteries		ELEC 32	Electrical Motors	X	X
e) Peripheral devices					
18) Ladder diagrams		ELEC 34	Motor Controls	X	X
19) Function, operation, and characteristics of timers, counters, sequencers		ELEC 34	Motor Controls	X	X
20) Utilize appropriate manual and information for start-up, maintenance, and testing		ELEC 34	Motor Controls	X	X
21) Utilize schematics for manual starters, automatic starters, speed regulators, and controllers		ELEC 34	Motor Controls	X	X
XII-D. Function, operation and characteristics of switches and relays					
1) Schematic including switches and relays		ELEC 34	Motor Controls	X	X
2) Installation and connection methods for various switch types		ELEC 34	Motor Controls	X	X
3) Installation and connection methods for various relays		ELEC 34	Motor Controls	X	X
4) Function, operation and characteristics of electronic sensor and pilot devices		ELEC 34	Motor Controls	X	X
5) Function, operation and characteristics of control transformers		ELEC 34	Motor Controls	X	X
a) leads of control transformers		ELEC 34	Motor Controls	X	X
b) proper sizing of control transformers		ELEC 34	Motor Controls	X	X
XII-E. Mechanical connections to utilize motors					
1) Operation of mechanical clutches and magnetic drives		ELEC 32	Electrical Motors	X	X
2) Direct and offset drives		ELEC 32	Electrical Motors	X	X
3) Proper pulley sizes required		ELEC 32	Electrical Motors	X	X
XII-F. Process control systems and devices					
1) Operating requirements followed by manual and automatic controllers		ELEC 32	Electrical Motors	X	X
2) Function, operation, characteristics and installation of:		ELEC 32	Electrical Motors	X	X
a) closed loop and open loop systems		ELEC 32	Electrical Motors	X	X
b) Feedback control		ELEC 32	Electrical Motors	X	X
c) Proportional control		ELEC 32	Electrical Motors	X	X
d) Integral control		ELEC 32	Electrical Motors	X	X
e) Derivative control		ELEC 32	Electrical Motors	X	X
3) Block diagrams, including control and devices		ELEC 32	Electrical Motors	X	X
4) The function, operation, characteristics of sensors and transmitters		ELEC 32	Electrical Motors	X	X

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CAC CURRICULUM ITEM	San Joaquin Delta College	COURSE(S) ID	COURSE TITLE	LEC	LAB
<b>XIII. GENERATORS AND POWER SUPPLIES</b>					
XIII-A. Principles of electromotive force		ELEC 32	Electrical Motors	X	X
XIII-B. Principles of generating electricity					
1) Parts, functions, operation and characteristics of the AC generator		ELEC 32	Electrical Motors	X	X
2) Parts, functions, operation and characteristics of the DC generator		ELEC 32	Electrical Motors	X	X
3) "left hand rule" for generators		ELEC 32	Electrical Motors	X	X
4) RPM, frequency and number of poles in a given generator		ELEC 32	Electrical Motors	X	X
5) 3 phase generation		ELEC 32	Electrical Motors	X	X
6) Wye and Delta windings		ELEC 32	Electrical Motors	X	X
7) 3 phase sine wave		ELEC 32	Electrical Motors	X	X
XIII-C. Types and configurations of uninterruptible power supplies (UPS)		ELEC 32	Electrical Motors	X	X
XIII-D. Types and configurations of battery systems used for UPS systems		ELEC 32	Electrical Motors	X	X
<b>XIV. TRANSFORMERS</b>					
XIV-A. Function, operation, and characteristics of transformers					
1) Electrical principles involved in transformer operation		ELEC 33	INDUSTRIAL WIRING METHODS	X	X
2) Transformer classifications and applications		ELEC 33	INDUSTRIAL WIRING METHODS	X	X
3) Transformer losses		ELEC 33	INDUSTRIAL WIRING METHODS	X	X
4) Ratios for voltage and amperage with respect to number of turns		ELEC 33	INDUSTRIAL WIRING METHODS	X	X
XIV-B. Selection and installation of transformers					
1) Nameplate information		ELEC 33	INDUSTRIAL WIRING METHODS	X	X
2) Techniques for sizing transformers (single and three phase)		ELEC 33	INDUSTRIAL WIRING METHODS	X	X
3) Determining if given transformer meets voltage, current, and impedance		ELEC 33	INDUSTRIAL WIRING METHODS	X	X
4) Calculating voltages and currents for load and windings		ELEC 33	INDUSTRIAL WIRING METHODS	X	X
5) Determining whether to use wye or delta wiring schemes		ELEC 33	INDUSTRIAL WIRING METHODS	X	X
6) Steps for receiving and preparing transformer for installation		ELEC 33	INDUSTRIAL WIRING METHODS	X	X
7) Necessary test to assure proper operation		ELEC 33	INDUSTRIAL WIRING METHODS	X	X
8) Proper techniques for power and load conductors		ELEC 33	INDUSTRIAL WIRING METHODS	X	X
9) Methods for determining proper type and values of electrical protective device		ELEC 33	INDUSTRIAL WIRING METHODS	X	X
10) Proper grounding procedures		ELEC 33	INDUSTRIAL WIRING METHODS	X	X
XIV-C. Distribution systems					
1) Functions, operation and characteristics of various types of distribution systems		ELEC 33	INDUSTRIAL WIRING METHODS	X	X
2) Criteria for selecting particular type of distribution system		ELEC 33	INDUSTRIAL WIRING METHODS	X	X
<b>XV. PERSONAL DEVELOPMENT</b>					
XV-A Orientation					
1) Make up and organization of the industry		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
a) Jobsite chain of command		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
(1) owner/customer		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
(2) architects/engineers		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
(3) inspection authorities		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
(4) construction managers		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
(5) general contractors		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
(6) other contractors and trades		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
2) Organizations within the industry		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
a) manufacturers		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
b) distributors		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
XV-B. Methods of working with others					
1) The three basic methods of motivation		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
2) Need levels of humans		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
3) The role of supervisors		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
a) leadership styles appropriate to certain situations		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
b) need for competent supervisors		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
4) Effective communications		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
a) importance of communications in the industry and on the job		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
b) barriers to communications		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
c) keys to effective communications		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X

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CAC CURRICULUM ITEM	San Joaquin Delta College	COURSE(S) ID	COURSE TITLE	LEC	LAB
XV-C. Economic considerations					
1) Why worker future is tied to employer's		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
2) Responsibilities of employer		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
a) keeping skills current		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
b) managing your future		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
3) Costs of doing business		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
4) Importance of satisfying customers		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
5) Impact of job performance, behavior and appearance on prospects for future work		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
6) Functions of marketing		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
<b>XVI. JOBSITE MANAGEMENT</b>					
1) Coordinating tool needs with office of other jobs		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
2) Coordinating schedule with other crafts		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
3) Developing timetables and progress charts		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
4) Completing time sheets, logs and other necessary documentation		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
5) Clearances or permits if necessary		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
6) Inventory and other necessary equipment according to job needs		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
7) Developing alternative solutions and choose the best alternative		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
8) Planning and organizing tasks to meet deadlines		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
9) Supervising and monitoring others		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
10) Picturing the way the project will appear when completed		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
<b>XVII. TESTING</b>					
XVII-A. Steps used for various testing processes					
1) Acceptance testing of cables		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
2) Maintenance testing of generators		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
3) Insulation tests using megohmmeter		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
XVII-B. Utilizing the results of testing procedures					
1) Special requirements for high voltage testing		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
2) Describe potential safety hazards		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
3) Characteristics and properties of high voltage cable and insulators		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
4) Appropriate tests, methods, voltages, and equipment		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	x	x
<b>XVIII. SPECIALTY SYSTEMS</b>					
XVIII-A. Fire Alarms					
1) Functions, operations and characteristics of various types of fire alarm systems and components		ELEC 15D	FIRE ALARMS	x	x
2) Code requirements and use code to answer specific questions		ELEC 15D	FIRE ALARMS	x	x
3) The functions, operation, and characteristics of fire alarm initiating and indicating		ELEC 15D	FIRE ALARMS	x	x
4) Multiplexing of system components		ELEC 15D	FIRE ALARMS	x	x
5) Various types of areas and methods to protect them		ELEC 15D	FIRE ALARMS	x	x
6) Appropriate wiring methods and devices		ELEC 15D	FIRE ALARMS	x	x
7) Utilize manuals to start-up and check out system		ELEC 15D	FIRE ALARMS	x	x
8) Utilize proper manuals and techniques for system maintenance and troubleshooting		ELEC 15D	FIRE ALARMS	x	x
XVIII-B. Security Alarms					
1) Functions, operations and characteristics of various types of security systems and components		ELEC 15E	Security Alarms	x	x
2) Code requirements and use code to answer specific questions		ELEC 15E	Security Alarms	x	x
3) The functions, operation, and characteristics of alarm initiating and indicating devices		ELEC 15E	Security Alarms	x	x
4) Multiplexing of system components		ELEC 15E	Security Alarms	x	x
5) Various types of areas and methods to protect them		ELEC 15E	Security Alarms	x	x
6) Appropriate wiring methods and devices		ELEC 15E	Security Alarms	x	x
7) Utilize manuals to start-up and check out system		ELEC 15E	Security Alarms	x	x
8) Utilize proper manuals and techniques for system maintenance and troubleshooting		ELEC 15E	Security Alarms	x	x

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CAC CURRICULUM ITEM	San Joaquin Delta College	COURSE(S) ID	COURSE TITLE	LEC	LAB
XVIII-C. Voice, Data, TV, Signaling Systems					
1) Functions, operation and characteristics of various types of voice, data, TV, and signaling systems		ELECT 15P	DATA, VOICE, TV, SIGNAL APPLICATIONS	X	X
2) The proper cabling systems required for various systems (telephone, data, Local Area Networks, etc.)		ELECT 15P	DATA, VOICE, TV, SIGNAL APPLICATIONS	X	X
3) Installation and connection techniques for cables and devices		ELECT 15P	DATA, VOICE, TV, SIGNAL APPLICATIONS	X	X
4) How cable defects and installation errors can degrade system		ELECT 15P	DATA, VOICE, TV, SIGNAL APPLICATIONS	X	X
5) Utilize manuals to install, test and start up and check out systems		ELECT 15P	DATA, VOICE, TV, SIGNAL APPLICATIONS	X	X
6) Utilize proper manuals and techniques for system maintenance and troubleshooting		ELECT 15P	DATA, VOICE, TV, SIGNAL APPLICATIONS	X	X
XVIII-D. Lightning Protection Systems					
1) Functions, operation and characteristics of lighting protection systems		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
2) The sizing, layout and installation of lighting protection systems		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
3) NEC requirements and interpretations		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
4) Size of conductors and electrodes		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
5) Installation of electrodes		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
6) Installation of conductors and connections to electrodes		ELEC 31, 33	ELECTRICAL WIRING METHODS AND INDUSTRIAL WIRING METHODS	X	X
XVIII-E. Fiber Optic Systems					
1) Functions, operation and characteristics of fiber optic cable		ELEC 15F	Fiber Optic Systems	X	X
2) Proper installation techniques		ELEC 15F	Fiber Optic Systems	X	X
a) minimum bend radius		ELEC 15F	Fiber Optic Systems	X	X
b) pulling techniques		ELEC 15F	Fiber Optic Systems	X	X
c) installation hardware		ELEC 15F	Fiber Optic Systems	X	X
d) splicing and termination		ELEC 15F	Fiber Optic Systems	X	X
3) Utilize appropriate manuals and equipment to perform system tests and		ELEC 15F	Fiber Optic Systems	X	X
XVIII-F. Heating, Air Conditioning and Refrigeration					
1) The function, operation and characteristics of heating, air conditioning, and refrigeration systems		MECH 75B	Refrigeration and Air Conditioning	X	X
2) Utilize appropriate manuals and equipment to perform system test and		MECH 75B	Refrigeration and Air Conditioning	X	X