

# Course Outline

Energy, Environment, and Utilities

REVISED: August/2017

**Job Title**

Electronics Technician

**72-55-50**

**Career Pathway:**

Telecommunications

**Electronics/1**

**Industry Sector:**

Energy, Environment, and Utilities

**Credits: 5**

**Hours: 90**

**O\*NET-SOC CODE:**

17-3023.01

**Course Description:**

This competency-based course is the first in a sequence of three designed for electronics. It provides students with project-based experiences in electromechanical installation and maintenance. Instruction includes an orientation, workplace safety policies and procedures, trade mathematics, resource management, and employability skills. Emphasis is placed on the safe use, maintenance, and storage of electronic tools and equipment, identification and fabrication of terminals, assembly and inspection of the different types of electrical connectors for quality assurance, principles and designs of direct current (DC) circuits, interpretation of blueprints and schematics, and basic soldering and de-soldering techniques. The competencies in this course are aligned with the California High School Academic Content Standards and the California Career Technical Education Model Curriculum Standards.

**CBEDS Title:**

Introduction to Electronics Technology

**Prerequisites:**

Enrollment requires a reading level of 6.0 as measured by the TABE D 9/10.

**CBEDS No.:**

5551

**NOTE:** For Perkins purposes this course has been designated as an **introductory** course.

This course cannot be repeated once a student receives a Certificate of Completion.



## **COURSE OUTLINE COMPETENCY-BASED COMPONENTS**

A course outline reflects the essential intent and content of the course described. Acceptable course outlines have six components. (Education Code Section 52506). Course outlines for all apportionment classes, including those in jails, state hospitals, and convalescent hospitals, contain the six required elements:

(EC 52504; 5CCR 10508 [b]; Adult Education Handbook for California [1977], Section 100)

### **COURSE OUTLINE COMPONENTS**

### **LOCATION**

#### **GOALS AND PURPOSES**

Cover

The educational goals or purposes of every course are clearly stated and the class periods are devoted to instruction. The course should be broad enough in scope and should have sufficient educational worth to justify the expenditure of public funds.

The goals and purpose of a course are stated in the COURSE DESCRIPTION. Course descriptions state the major emphasis and content of a course, and are written to be understandable by a prospective student.

#### **PERFORMANCE OBJECTIVES OR COMPETENCIES**

pp. 7-13

Objectives should be delineated and described in terms of measurable results for the student and include the possible ways in which the objectives contribute to the student's acquisition of skills and competencies.

Performance Objectives are sequentially listed in the COMPETENCY-BASED COMPONENTS section of the course outline. Competency Areas are units of instruction based on related competencies. Competency Statements are competency area goals that together define the framework and purpose of a course. Competencies fall on a continuum between goals and performance objectives and denote the outcome of instruction.

Competency-based instruction tells a student before instruction what skills or knowledge they will demonstrate after instruction. Competency-based education provides instruction which enables each student to attain individual goals as measured against pre-stated standards.

Competency-based instruction provides immediate and continual repetition and In competency-based education the curriculum, instruction, and assessment share common characteristics based on clearly stated competencies. Curriculum, instruction and assessment in competency-based education are: explicit, known, agreed upon, integrated, performance oriented, and adaptive.

**COURSE OUTLINE COMPETENCY-BASED COMPONENTS**  
**(continued)**

<b>COURSE OUTLINE COMPONENTS</b>	<b>LOCATION</b>
<b>INSTRUCTIONAL STRATEGIES</b>	p. 15
<p>Instructional techniques or methods could include laboratory techniques, lecture method, small-group discussion, grouping plans, and other strategies used in the classroom.</p> <p>Instructional strategies for this course are listed in the TEACHING STRATEGIES AND EVALUATION section of the course outline. Instructional strategies and activities for a course should be selected so that the overall teaching approach takes into account the instructional standards of a particular program, i.e., English as a Second Language, Programs for Adults with Disabilities.</p>	
<b>UNITS OF STUDY, WITH APPROXIMATE HOURS ALLOTTED FOR EACH UNIT</b>	Cover
<p>The approximate time devoted to each instructional unit within the course, as well as the total hours for the course, is indicated. The time in class is consistent with the needs of the student, and the length of the class should be that it ensures the student will learn at an optimum level.</p> <p>Units of study, with approximate hours allotted for each unit are listed in the COMPETENCY AREA STATEMENT(S) of the course outline. The total hours of the course, including work-based learning hours (community classroom and cooperative vocational education) is listed on the cover of every CBE course outline. Each Competency Area listed within a CBE outline is assigned hours of instruction per unit.</p>	
<b>EVALUATION PROCEDURES</b>	pp. 15
<p>The evaluation describes measurable evaluation criteria clearly within the reach of the student. The evaluation indicates anticipated improvement in performances as well as anticipated skills and competencies to be achieved.</p> <p>Evaluation procedures are detailed in the TEACHING STRATEGIES AND EVALUATION section of the course outline. Instructors monitor students' progress on a continuing basis, assessing students on attainment of objectives identified in the course outline through a variety of formal and informal tests (applied performance procedures, observations, and simulations), paper and pencil exams, and standardized tests.</p>	
<b>REPETITION POLICY THAT PREVENTS PERPETUATION OF STUDENT ENROLLMENT</b>	Cover
<p>After a student has completed all the objectives of the course, he or she should not be allowed to reenroll in the course. There is, therefore, a need for a statement about the conditions for possible repetition of a course to prevent perpetuation of students in a particular program for an indefinite period of time.</p>	

## **ACKNOWLEDGMENTS**

Thanks to PAUL PIDOUX and MARCELA BAKER for developing and editing this curriculum. Acknowledgment is also given to ERICA ROSARIO for designing the original artwork for the course covers.

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# **CALIFORNIA CAREER TECHNICAL EDUCATION MODEL CURRICULUM STANDARDS**

## ***Energy, Environment and Utilities Industry Sector***

### ***Knowledge and Performance Anchor Standards***

#### **1.0 Academics**

Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Energy, Environment, and Utilities academic alignment matrix for identification of standards.

#### **2.0 Communications**

Acquire, and accurately use Energy, Environment, and Utilities sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats.

#### **3.0 Career Planning and Management**

Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans.

#### **4.0 Technology**

Use existing and emerging technology to investigate, research, and produce products and services, including new information, as required in the Energy, Environment, and Utilities sector workplace environment.

#### **5.0 Problem Solving and Critical Thinking**

Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the Energy, Environment, and Utilities sector using critical and creative thinking; logical reasoning, analysis, inquiry, and problem-solving techniques.

#### **6.0 Health and Safety**

Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Energy, Environment, and Utilities sector workplace environment.

#### **7.0 Responsibility and Flexibility**

Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Energy, Environment, and Utilities sector workplace environment and community settings.

#### **8.0 Ethics and Legal Responsibilities**

Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms.

#### **9.0 Leadership and Teamwork**

Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution as practiced in the SkillsUSA career technical student organization.

#### **10.0 Technical Knowledge and Skills**

Apply essential technical knowledge and skills common to all pathways in the Energy, Environment, and Utilities sector.

#### **11.0 Demonstration and Application**

Demonstrate and apply the knowledge and skills contained in the Energy, Environment, and Utilities anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings, and through the SkillsUSA career technical student organization.

## ***Energy, Environment, and Utilities Sector Pathway Standards***

### **C. Telecommunications Pathway**

The Telecommunications pathway prepares students for employment and postsecondary education and training in the wireless and fixed-line communications industries. The sharing of information is essential for personal, commercial, educational, government, and military functions. Information is stored, sent, and accessed primarily via the telecommunications industries.

Sample occupations associated with this pathway:

- ◆ Cable/Telecommunications Installation and Maintenance Technicians
- ◆ Line Workers
- ◆ Network Operators, Technicians, Designers, and Managers
- ◆ Network Security Administrator
- ◆ Satellite Systems Installation/Engineers

- C1.0 Understand the basic principles and concepts that impact the telecommunications industry, including systems, concepts, and regulations.
- C2.0 Demonstrate understanding and use of the basic and emerging technologies that impact the telecommunications industry.
- C3.0 Examine the role and functions of satellites in telecommunications.
- C4.0 Research the components, interaction, and operations of wireless telecommunications systems.
- C5.0 Research the components, interaction, and operations of fixed-wire telecommunications systems.
- C6.0 Consider privacy and security issues of the telecommunications systems.

**CBE**  
**Competency-Based Education**

**COMPETENCY-BASED COMPONENTS**  
**for the Electronics/1 Course**

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
<p>A. ORIENTATION AND SAFETY</p> <p>Understand, apply, and evaluate classroom and workplace policies and procedures used in accordance with federal, state, and local safety and environmental regulations.</p> <p>(3 hours)</p>	<ol style="list-style-type: none"> <li>1. Describe the scope and purpose of the course.</li> <li>2. Describe the overall course content as a part of the Linked Learning Initiative.</li> <li>3. Describe classroom policies and procedures.</li> <li>4. Describe the different occupations in the Energy and Utilities Industry Sector which have an impact on the role of electronics technicians.</li> <li>5. Describe the opportunities available for promoting gender equity and the representation of non-traditional populations in electronics.</li> <li>6. Describe the impact of Environmental Protection Agency (EPA) legislation on the Energy and Utilities Industry Sector practices.</li> <li>7. Describe and demonstrate the procedures for contacting proper authorities for the removal of hazardous materials based on the EPA standards.</li> <li>8. Describe the purpose of the California Occupational Safety and Health Administration (Cal/OSHA) and its laws governing electronics technicians.</li> <li>9. Describe and demonstrate the use of the Material Safety Data Sheet (MSDS) as it applies to the electronics industry.</li> <li>10. Describe classroom and workplace first aid and emergency procedures according to American Red Cross (ARC) standards.</li> <li>11. Describe how each of the following insures a safe workplace:               <ol style="list-style-type: none"> <li>a. employees' rights as they apply to job safety</li> <li>b. employers' obligations as they apply to safety</li> <li>c. safety laws applying to electrical tools</li> </ol> </li> <li>12. Pass the safety test with 100% accuracy.</li> </ol>	<p><b>Career Ready Practice:</b> 1, 3, 6, 7</p> <p><b>CTE Anchor:</b> Communications: 2.1, 2.2, 2.3 Career Planning and Management: 3.1, 3.3, 3.4, 3.5 Technology: 4.5 Health and Safety: 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9, 6.11, 6.12, 6.13, 6.14, 6.16 Leadership and Teamwork: 9.6 Technical Knowledge and Skills: 10.1, 10.2</p> <p><b>CTE Pathway:</b> C1.1, C6.4, C7.1</p>
<p>B. TRADE MATHEMATICS</p> <p>Understand, apply, and evaluate the mathematical requirements in electronics work.</p>	<ol style="list-style-type: none"> <li>1. Describe the practical applications of math in electronics work.</li> <li>2. Describe and demonstrate problem-solving techniques involving whole number problems, using arithmetic operations (addition, subtraction, multiplication, and division).</li> <li>3. Describe and demonstrate problem-solving techniques involving various fraction problems using arithmetic operations.</li> <li>4. Describe and demonstrate problem-solving techniques involving various decimal problems using addition, subtraction, multiplication, and division.</li> <li>5. Describe and demonstrate techniques for changing fractions to decimals.</li> </ol>	<p><b>Career Ready Practice:</b> 1, 5</p> <p><b>CTE Anchor:</b> Communications: 2.1, 2.2, 2.3, 2.4 Problem Solving and Critical Thinking: 5.1, 5.3, 5.4</p>

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(8 hours)	<ol style="list-style-type: none"> <li>6. Describe and demonstrate techniques for changing decimals to fractions.</li> <li>7. Describe the English system of measuring length.</li> <li>8. Describe the English system of measuring weight.</li> <li>9. Describe the English system of measuring volume or capacity.</li> <li>10. Describe and demonstrate problem-solving techniques for various English system measuring problems using arithmetic operations.</li> <li>11. Describe and demonstrate measuring techniques for objects by using the English system measuring tools common to the trade.</li> <li>12. Express metric units in ascending and descending powers of ten.</li> <li>13. Convert the English numbering system to metric system.</li> <li>14. Convert the metric system to the English numbering system.</li> <li>15. Calculate square roots of regular numbers.</li> <li>16. Describe and demonstrate problem-solving techniques for geometric problems.</li> <li>17. Describe and demonstrate problem-solving techniques for algebraic problems.</li> <li>18. Define and demonstrate problem-solving techniques using percentages.</li> <li>19. Define and demonstrate techniques for reading and interpreting graphs.</li> <li>20. Define and demonstrate the conversion of decimal numbers to binary numbers.</li> <li>21. Define and demonstrate the conversion of binary numbers to decimal numbers.</li> </ol>	<p>Technical Knowledge and Skills: 10.1</p> <p><b>CTE Pathway:</b> C1.5, C3.7</p>
<p>C. RESOURCE MANAGEMENT</p> <p>Understand, apply, and evaluate resource management principles and techniques in the electronics business.</p>	<ol style="list-style-type: none"> <li>1. Define the following: <ol style="list-style-type: none"> <li>a. resources</li> <li>b. management</li> <li>c. sustainability</li> </ol> </li> <li>2. Describe the management of the following resources in the electronics business: <ol style="list-style-type: none"> <li>a. time</li> <li>b. materials</li> <li>c. personnel</li> </ol> </li> <li>3. List specific examples of effective management of the following in the electronics business: <ol style="list-style-type: none"> <li>a. time</li> <li>b. materials</li> <li>c. personnel</li> </ol> </li> <li>4. Describe the benefits of effective resource management in the electronics business: <ol style="list-style-type: none"> <li>a. profitability</li> <li>b. sustainability</li> <li>c. company growth</li> </ol> </li> <li>5. Describe the economic benefits and liabilities of managing resources in an environmentally responsible way.</li> </ol>	<p><b>Career Ready Practice:</b> 1, 2, 3, 5, 8</p> <p><b>CTE Anchor:</b> Communications: 2.1, 2.2, 2.3, 2.4 Career Planning and Management: 3.3 Problem Solving and Critical Thinking: 5.3, 5.4 Responsibility and Flexibility: 7.1, 7.2, 7.3, 7.4, 7.6 Ethics and Legal Responsibilities: 8.1, 8.4, 8.5 Leadership and Teamwork: 9.1, 9.2, 9.6</p>

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(1 hour)		Technical Knowledge and Skills: 10.1, 10.2  <b>CTE Pathway:</b> C1.1
<p>D. ELECTRONIC TOOLS AND EQUIPMENT</p> <p>Understand, apply, and evaluate the techniques for using, maintaining, and storing standard electronic tools and equipment.</p>	<ol style="list-style-type: none"> <li>1. Describe and demonstrate the proper use, maintenance, and storage techniques for the following basic electronic tools and equipment:               <ol style="list-style-type: none"> <li>a. long nose pliers, 3"</li> <li>b. diagonal cutting pliers, 3"</li> <li>c. combination slip or groove joint pliers</li> <li>d. flat nose cutting pliers, 3" (nippers)</li> <li>e. miniature jeweler screwdrivers (flat blade and Phillips)</li> <li>f. TORX® Drivers</li> <li>g. Posidriv® Drivers</li> <li>h. screwdrivers, flat blade, 4" (1/8, 3/16, 1/4, and 5/16)</li> <li>i. screwdrivers, Phillips head 4" (#1, #2, and #3)</li> <li>j. wire strippers</li> <li>k. adjustable wire strippers</li> <li>l. needle nose pliers, 3"nut driver set (1/8 - 3/4)</li> <li>m. files, precision/miniature</li> <li>n. heat sink</li> <li>o. solder/desolder vacuum sucker</li> <li>p. component removal/insertion tool</li> <li>q. IC Insertion/removal tool</li> <li>r. IC Extender device (14, 16, 18)</li> <li>s. flashlight</li> <li>t. LCR meter (optional)</li> <li>u. telescoping magnet</li> </ol> </li> <li>2. Describe and demonstrate the proper use, maintenance, and storage techniques used for the following electronic testing instruments:               <ol style="list-style-type: none"> <li>a. a digital multimeter</li> <li>b. analog voltmeters</li> <li>c. an oscilloscope</li> <li>d. a signal generator</li> </ol> </li> <li>3. Describe the Ohmmeter's function and range and method of use.</li> <li>4. Describe and demonstrate the following:               <ol style="list-style-type: none"> <li>a. reading and interpreting linear-meter scale and non-linear meter scale on an Ohmmeter</li> <li>b. adjusting the Ohmmeter's function and range</li> <li>c. measuring unknown value with an Ohmmeter</li> <li>d. measuring the relationship of current to voltage and resistance using an electronic voltage Ohmmeter</li> </ol> </li> <li>5. Describe voltmeter function, range, and method of use.</li> <li>6. Describe and demonstrate the following:</li> </ol>	<p><b>Career Ready Practice:</b> 1, 3</p> <p><b>CTE Anchor:</b> Communication: 2.1, 2.2, 2.3 Health and Safety: 6.3, 6.6, 6.9, 6.15, 6.16 Technical Knowledge and Skills: 10.1</p> <p><b>CTE Pathway:</b> C5.7</p>

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(5 hours)	<ul style="list-style-type: none"> <li>a. checking voltage using various ranges</li> <li>b. measuring ten unknown voltages with a voltmeter</li> </ul> 7. Describe and demonstrate proper data recording techniques.	
E. TERMINALS  Understand, apply, and evaluate the techniques for identifying and fabricating various types of terminating points utilized in assembly.  (10 hours)	<ul style="list-style-type: none"> <li>1. Define the following:               <ul style="list-style-type: none"> <li>a. terminals</li> <li>b. leads</li> <li>c. soldering</li> <li>d. grommets</li> </ul> </li> <li>2. Identify the types and sizes of terminals.</li> <li>3. Describe and demonstrate the following:               <ul style="list-style-type: none"> <li>a. termination of wires and leads</li> <li>b. termination of components</li> <li>c. dressing, tying, and attaching wires</li> <li>d. soldering connections</li> <li>e. inspecting and testing components and assemblies</li> </ul> </li> </ul>	<b>Career Ready Practice:</b> 1  <b>CTE Anchor:</b> Communications: 2.1, 2.2, 2.3 Health and Safety: 6.6, 6.12, 6.15 Technical Knowledge and Skills: 10.1, 10.2, 10.3  <b>CTE Pathway:</b> C1.1, C5.8, C5.9
F. CONNECTORS  Understand, apply, and evaluate the techniques used in assembling the various types of electrical connectors according to industry specifications.  (10 hours)	<ul style="list-style-type: none"> <li>1. Identify the following types of electrical connectors:               <ul style="list-style-type: none"> <li>a. pierced/terminal</li> <li>b. crimped/pin</li> <li>c. cup/terminal</li> </ul> </li> <li>2. Describe and demonstrate the assembly and inspection of the various types of electrical connectors for quality assurance.</li> </ul>	<b>Career Ready Practice:</b> 1  <b>CTE Anchor:</b> Communications: 2.1, 2.2, 2.3, 2.4 Problem Solving and Critical Thinking: 5.1, 5.2, 5.3, 5.4 Health and Safety: 6.6, 6.15 Ethics and Legal Responsibilities: 8.1 Technical Knowledge and Skills: 10.1, 10.2  <b>CTE Pathway:</b> C5.8, C5.9

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
<p>G. DIRECT CURRENT (DC) CIRCUITS</p> <p>Understand, apply, and evaluate the principles of DC circuits.</p>	<ol style="list-style-type: none"> <li>1. Define the following:               <ol style="list-style-type: none"> <li>a. electronics</li> <li>b. matter</li> <li>c. atoms</li> <li>d. electrons</li> <li>e. molecules</li> <li>f. conductor                   <ol style="list-style-type: none"> <li>i. nonmetallic</li> <li>ii. metallic</li> </ol> </li> <li>g. electrical charges</li> <li>h. electricity</li> <li>i. electrostatic fields</li> <li>j. dielectric fields</li> <li>k. electrostatic induction</li> <li>l. static electricity</li> <li>m. energy</li> <li>n. potential energy</li> <li>o. kinetic energy</li> <li>p. binding energy</li> <li>q. work</li> <li>r. magnetism</li> <li>s. electromagnetism</li> <li>t. current (a.k.a. amperage)</li> <li>u. direct current (DC)voltage</li> <li>v. power (a.k.a. watts) resistance (a.k.a. ohms)</li> <li>w. Ohm's Law</li> <li>x. circuit parameters</li> <li>y. simple circuits</li> <li>z. series circuits</li> <li>aa. parallel circuits</li> </ol> </li> <li>2. Describe the features and functions of the following:               <ol style="list-style-type: none"> <li>a. resistors</li> <li>b. potentiometers</li> <li>c. switches</li> <li>d. fuses</li> <li>e. relays</li> <li>f. batteries</li> </ol> </li> <li>3. Describe and demonstrate the following:               <ol style="list-style-type: none"> <li>a. designing direct current circuits with components such as resistors, relays, switches, lamps, batteries, and capacitors, using schematic diagrams</li> <li>b. drawing a schematic diagram from a wiring diagram</li> <li>c. measuring current using a multimeter</li> <li>d. measuring voltage using a multimeter</li> <li>e. measuring resistance using a multimeter</li> <li>f. building an original basic direct current circuit</li> <li>g. using Ohm's Law to calculate circuit parameters for a series circuit</li> <li>h. illustration and construction of a series circuit with a minimum of three resistances</li> </ol> </li> </ol>	<p><b>Career Ready Practice:</b> 1, 3, 5</p> <p><b>CTE Anchor:</b> Communications: 2.1, 2.2, 2.3, 2.4 Problem Solving and Critical Thinking: 5.1, 5.4 Health and Safety: 6.8, 6.13, 6.16 Technical Knowledge and Skills: 10.1, 10.2, 10.3</p> <p><b>CTE Pathway:</b> C5.6</p>

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(25 hours)	<ul style="list-style-type: none"> <li>i. calculation and measurement of circuit parameters for a series circuit</li> <li>4. Describe the following:               <ul style="list-style-type: none"> <li>a. electromagnetic properties</li> <li>b. relationship between electricity and magnetism</li> </ul> </li> <li>5. Describe and demonstrate the construction of a simple electromagnet.</li> </ul>	
<p>H. BLUEPRINTS AND SCHEMATICS</p> <p>Understand, apply, and evaluate the techniques for interpreting prints, schematics, and related paper work used in the assembly of electronic units.</p> <p>(5 hours)</p>	<ul style="list-style-type: none"> <li>1. Define the following:               <ul style="list-style-type: none"> <li>a. prints</li> <li>b. schematics</li> <li>c. title block</li> <li>d. parts list</li> <li>e. orthographic projection</li> </ul> </li> <li>2. Identify symbols and abbreviations for blue prints and schematics.</li> <li>3. Describe the techniques for evaluating pictorial drawings.</li> <li>4. Evaluate at least five pictorial drawings, prints, and/or schematics.</li> </ul>	<p><b>Career Ready Practice:</b> 1, 10</p> <p><b>CTE Anchor:</b> Communications: 2.1, 2.2, 2.3, 2.4 Problem Solving and Critical Thinking: 5.3, 5.4 Ethics and Legal Responsibilities: 8.1 Technical Knowledge and Skills: 10.1, 10.2, 10.3</p> <p><b>CTE Pathway:</b> C2.9, C5.10</p>
<p>I. SOLDERING</p> <p>Understand, apply, and evaluate basic soldering and desoldering techniques.</p>	<ul style="list-style-type: none"> <li>1. Define the following:               <ul style="list-style-type: none"> <li>a. soldering</li> <li>b. desoldering</li> <li>c. tinning</li> <li>d. solder bridge</li> </ul> </li> <li>2. Identify and demonstrate the proper use, maintenance, and storage techniques for the following common hand tools used in electronics:               <ul style="list-style-type: none"> <li>a. soldering iron</li> <li>b. wire strippers</li> <li>c. wire gauges</li> <li>d. crimping tools</li> <li>e. microscopes</li> <li>f. pliers</li> <li>g. screwdrivers</li> <li>h. solder wick</li> <li>i. static sensitive devices (ESD)</li> </ul> </li> <li>3. Describe the basic purpose of electronic soldering.</li> <li>4. Identify the following:               <ul style="list-style-type: none"> <li>a. type of solder most used in electronic component hand soldering</li> </ul> </li> </ul>	<p><b>Career Ready Practice:</b> 1, 3, 4</p> <p><b>CTE Anchor:</b> Communications: 2.1, 2.2, 2.3, Health and Safety: 6.1, 6.3, 6.6, 6.7, 6.8, 6.9, 6.11, 6.13, 6.14, 6.15, 6.16 Responsibility and Flexibility: 7.5, 7.7 Ethics and Legal Responsibilities: 8.4 Technical Knowledge and Skills: 10.1, 10.2, 10.3</p>

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(20 hours)	<ul style="list-style-type: none"> <li>b. soldering iron most often used on electronic circuit boards</li> <li>c. common causes for a cold solder joint</li> <li>d. common solder removing techniques</li> <li>e. characteristics of a good solder connection</li> <li>f. time and manner of cleaning a soldering iron tip</li> </ul> <p>5. Describe and demonstrate the following:</p> <ul style="list-style-type: none"> <li>a. protection of temperature sensitive components and static sensitive devices (ESD), using protective devices</li> <li>b. proper soldering techniques on a printed circuit board</li> <li>c. proper desoldering techniques on a printed circuit board</li> <li>d. proper techniques in tinning and coupling stranded wire</li> </ul>	<p><b>CTE Pathway:</b> C5.2, C5.5, C5.7, C5.8, C5.9</p>
<p>J. EMPLOYABILITY SKILLS</p> <p>Understand, apply, and evaluate the employability skills required in electronics work.</p> <p>(3 hours)</p>	<ul style="list-style-type: none"> <li>1. Describe employer requirements for the following: <ul style="list-style-type: none"> <li>a. punctuality</li> <li>b. attendance</li> <li>c. attitude toward work</li> <li>d. quality of work</li> <li>e. teamwork</li> <li>f. timeliness</li> <li>g. communication skills</li> <li>h. computer skills and software applications</li> </ul> </li> <li>2. Identify potential employers through traditional and internet sources.</li> <li>3. Describe the role of electronic social networking in job search.</li> <li>4. Design sample résumés and cover letters.</li> <li>5. Explain the importance of filling out a job application legibly, with accurate and complete information.</li> <li>6. Describe the common mistakes that are made on job applications.</li> <li>7. Complete sample job application forms correctly.</li> <li>8. State the importance of enthusiasm in the interview and on a job.</li> <li>9. State the importance of appropriate appearance in the interview and on a job.</li> <li>10. State the importance of the continuous upgrading of job skills.</li> <li>11. Describe customer service as a method of building permanent relationships between the organization and the customer.</li> <li>12. Describe and demonstrate appropriate interviewing techniques.</li> <li>13. Identify the informational materials and resources needed to be successful in an interview.</li> <li>14. Design sample follow-up letters.</li> <li>15. Describe and demonstrate appropriate follow-up procedures.</li> </ul>	<p><b>Career Ready Practice:</b> 1, 2, 3, 5, 10, 11</p> <p><b>CTE Anchor:</b> Communications: 2.1, 2.2, 2.3, 2.4, 2.5 Career Planning and Management: 3.1, 3.2, 3.4, 3.5, 3.6, 3.8, 3.9 Technology: 4.2, 4.6 Responsibility and Flexibility: 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7 Ethics and Legal Responsibilities: 8.4, 8.5 Leadership and Teamwork: 9.2, 9.3, 9.4, 9.6 Technical Knowledge and Skills: 10.1, 10.2 Demonstration and Application: 11.1, 11.2, 11.5</p> <p><b>CTE Pathway:</b> C1.1, C1.2, C2.9, C6.4, C7.1, C7.2, C7.4</p>

## ***SUGGESTED INSTRUCTIONAL MATERIALS and OTHER RESOURCES***

### **TEXTS AND SUPPLEMENTAL BOOKS**

Bishop, Owen. Electronics: Circuits and Systems, 3<sup>rd</sup> Edition. Elsevier Science and Technology, 2007.

Grob, Bernard and Mitchell E. Schultz. Basic Electronics, 5<sup>th</sup> Edition. McGraw-Hill Companies, 2002.

Herrick, Clyde. Basic Electronics Math. Elsevier Science, 2007.

Schuler, Charles A. Electronics: Principles and Applications, 6<sup>th</sup> Edition. McGraw-Hill and Companies, 2002.

### **RESOURCES**

Employer Advisory Board members

CTE Model Curriculum Standards

<http://www.cde.ca.gov/ci/ct/sf/documents/energyutilities.pdf>

California Building Standards Commission

[www.bsc.ca.gov/default.htm](http://www.bsc.ca.gov/default.htm)

Green Building Advisor.com

[greenbuildingadvisor.com](http://greenbuildingadvisor.com)

The Daily Green

[thedailygreen.com](http://thedailygreen.com)

### **COMPETENCY CHECKLIST**

## ***TEACHING STRATEGIES and EVALUATION***

### **METHODS AND PROCEDURES**

- A. Lecture and discussion
- B. Multimedia presentations
- C. Demonstrations and participation
- D. Individualized instruction
- E. Peer teaching
- F. Role-playing
- G. Guest speakers
- H. Field trips and field study experiences
- I. Projects

### **EVALUATION**

SECTION A – Orientation and Safety – Pass the safety test with 100% accuracy.

SECTION B – Trade Mathematics – Pass all assignments and exams on trade mathematics with a minimum score of 80% or higher.

SECTION C – Resource Management – Pass all assignments and exams on resource management with a minimum score of 80% or higher.

SECTION D – Electronic Tools and Equipment – Pass all assignments and exams on electronic tools and equipment with a minimum score of 80% or higher.

SECTION E – Terminals – Pass all assignments and exams on terminals with a minimum score of 80% or higher.

SECTION F – Connectors – Pass all assignments and exams on connectors with a minimum score of 80% or higher.

SECTION G – Direct Current (DC) Circuits – Pass all assignments and exams on direct current (DC) circuits with a minimum score of 80% or higher.

SECTION H – Blueprints and Schematics – Pass all assignments and exams on blueprints and schematics with a minimum score of 80% or higher.

SECTION I – Soldering – Pass all assignments and exams on soldering with a minimum score of 80% or higher.

SECTION J – Employability Skills – Pass all assignments and exams on employability skills with a minimum score of 80% or higher.

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### Statement for Civil Rights

All educational and vocational opportunities are offered without regard to race, color, national origin, gender, or physical disability.

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