EL DORADO UNION HIGH SCHOOL DISTRICT
Educational Services

Course of Study Information Page

Course Title: Basic Electronics (#544)	
Rationale: Electricity and Electronics is virtually in every person's life whether at home, on the job, recreation, etc. This course gives the student the opportunity to both explore the nature of electricity and to help him or her to decide on a future in the field of Electricity or electronics.	
Course Description: In this course, the student will learn the fundamentals of electronics and a deep understanding of Direct Current (D.C.). This course is articulated with colleges teaching D.C. circuits and the students may have an opportunity to receive college credit upon taking a college made test administered by the instructor. The outline below will show specifically what will be taught.	
Length of Course:	1 Year
Grade Level:	10 - 12
Credit: Number of units: 5 units per semester ❒ Meets graduation requirements ❒ Request for UC "a-f" requirements ❒ College Prep ☒ Elective ☒ Vocational	
Prerequisites:	Shop Fundamentals or teacher permission; algebra recommended
Department(s):	Trades and Industry
District Sites:	Ponderosa High School
Board of Trustees Adoption Date:	5-9-00
Textbook(s)/Instructional Materials:	No one textbook is used. Students get all information from teacher designed worksheets, lab experiences, quizzes, note outlines, etc. Reference books available.
Date Adopted by the Board of Trustees:	5-23-00 (in lieu of funds)

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Basic Electronics

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UNIT #0: Lab Orientation & Inventory

GOAL: Students will know how to inventory and identify all the laboratory tools, parts, and equipment that they will be using during the year.

OBJECTIVES The student will:	ACTIVITIES
1. Demonstrate their ability to find the tools, parts, and equipment that they will need during the year by completing an extensive inventory list. This list will be checked by the teacher and continually used by the student for the duration of this course.	1. Each student will be given a lab inventory sheet provided by the instructor. On this sheet the student will compare required items and quantities with actual items present and their quantities. The differences will be recorded and turned in to the teacher for validation. This list will be then returned and the student will continually use it for the duration of the course.

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UNIT #1: Safety

GOAL: Students will know and understand basic safety practices and procedures associated with electricity.

OBJECTIVES The student will:	ACTIVITIES
1. Demonstrate a knowledge of general shop safety by passing a written teacher made test with a score of 100%.	1. Safe shop attitudes will be discussed and the safe operation of tools used in electronics will be demonstrated by the instructor. 2. Class A, B, and C fires and how to control them will be discussed. 3. All students will demonstrate a proper attitude toward safety by adhering to all rules pertaining to tools and machines; by wearing clothing appropriate for lab work; by wearing proper eye protection; and by participating in the lab's daily housekeeping activities.
2. Demonstrate a working knowledge of safe electrical practices by the manner in which each job is carried out.	1. Each student must demonstrate by written test and through applied lab activities the safety practices necessary when working with 100 volts or more. 2. Students will perform all necessary procedures to insure safety BEFORE working with electrical equipment.

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UNIT #2: Meters & Electrical Team

GOAL: Students will know how to use the power supply and meters at their lab stations.

OBJECTIVES The student will:	ACTIVITIES
1. Demonstrate their ability to use the lab station power supply by completing a lab assignment (2L1) and passing an oral hands-on lab test.	1. Each student will be given (2L1) an assignment sheet that they will complete in the lab stations. This sheet will teach them how to use the power supply so that they will know how to set up various voltages.
2. Demonstrate their ability to use the D.C. & A.C. lab station voltmeters and ammeters by completing a laboratory assignment and passing written teacher made tests.	2. Students will learn how to read a linear scale and then demonstrate this ability by doing so in the above (2L1) assignment sheet.
3. Demonstrate their ability to use the Simpson #260 multi-meter for measuring voltage, resistance, and continuity as evidenced by a laboratory assignment and an accompanying teacher made test.	3. Students will take notes on a teacher prepared outline and demonstrate their understanding by using the Simpson #260 multi-meter to measure various voltages.

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UNIT #3: Soldering Wire Connections & Circuit Boards

GOAL: Students will show knowledge of proper soldering and wiring techniques used in the electronic industry. (The students will be tested by an eight standard of measure which has been set up by the teacher and his ROP advisory committee)

OBJECTIVES The student will:	ACTIVITIES
1. Demonstrate ability to identify the five common wire connections commonly used in electrical wiring by passing a written teacher made test.	1. Students with a handout sheet will learn and observe the instructor through demonstration of the five common wire connections.
2. Be able to list the eight standards of industry to look for in a properly connection. Students will show this knowledge by passing a written. (3Q1)	2. The teacher will lecture and demonstrate the eight standards of soldering used in industry. Students will take notes on a teacher prepared outline. (3N1)
3. Demonstrate knowledge of a properly prepared, connected, and soldered wire connection by doing three of the five common splices selected at random by the teacher. These connections will be graded by the teacher according to the eight industrial standards.	3. Students will practice (about 6 hours) and demonstrate skills learned related to the eight industrial standards.
4. Demonstrate ability to assemble parts on a P.C. board without damaging the board or the parts. This will be done on a required project which will be evaluated and graded by the teacher.	4. Students will mount and solder various electronic parts onto a printed circuit board and turn in for grading by the teacher.
5. Demonstrate ability to dissemble parts off a P.C. board without damaging the board or the parts by doing so on their project or another P.C. board selected by the teacher.	5. Students will de-solder and dismount any misplaced parts on a circuit board without damaging the part or the board.

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UNIT #4: Electrical Tools, Wire Conductors, & Insulators

GOAL: Students will show knowledge of the tools, wire conductors, and insulators commonly used in electricity/electronics and demonstrate their proper use.

OBJECTIVES The student will:	ACTIVITIES
1. Demonstrate ability to identify common electricity/electronic tools by passing a written teacher made test.	1. Students will watch the instructor demonstrate the proper use of common hand tools used in electrical work.
2. Demonstrate skills by using common electricity/electronic tools to make connections which will be graded by the teacher. (See Soldering wire connections competencies - Unit 8.)	2. Students will use property electronic tools while: A. Soldering B. Wire working C. Fabricating D. Repairing
3. Demonstrate knowledge of wire conductors, insulators, and sizes by passing a written teacher made test.	3. The teacher will pass out an information sheet and show and explain conductors, insulators, and wire size rationale.
4. Demonstrate knowledge of how to select the proper wire and remove the insulation without scaring or breaking the wire by passing a written test.	4. Students will observe a teacher demonstration of wire selection and insulation removal and demonstrate this skill in the soldering unit.

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UNIT #5: Understanding Electricity

GOAL: Students will have a basic understanding of electricity.

OBJECTIVES The student will:	ACTIVITIES
1. Demonstrate knowledge of how electricity flows in a conductor by passing a written teacher made test.	1. Students will hookup a simple circuit and observe the polarities and meter hookups to determine the direction of current flow. (5L1)
2. Demonstrate ability to differentiate between static, D.C. current, and A.C. current electricity as evidenced by a written teacher made test.	2. Each student will identify both with written and oral tests the difference between static, D.C. current, and A.C. current electricity.
3. Show knowledge of the 4 parts of a circuit by taking a teacher made test.	3. Each student will hook up and operate many circuits and observe what the each of the 4 parts do.(5L2-5L5)

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UNIT #6: Resistors and Identification Codes

GOAL: Students will know and understand the functions of resistors and how they are coded.

OBJECTIVES The student will:	ACTIVITIES
1. Demonstrate knowledge of what a resistor does by orally defining it to the teacher.	1. Each student will, after studying and the use of worksheets, stand in front of the class and tell what a resistor is, read the code on the resistor, and then tell the coded value in ohms of the resistor.
2. Demonstrate the ability to decode a four or five color, three or four number, or an alpha/numeric resistor by passing a practical, oral, and written teacher made test.	2. Each student will learn and use the following codes for determining the value of various resistors: a. Direct reading b. Color code – 4 and 5 color c. Numeric code – 3 and 4 number d. Alpha/numeric code
3. Demonstrate the ability to determine whether a resistor is good or bad by decoding the resistor's tolerance, finding it's range, and measuring it to see if it falls within the allowable tolerance.	3. Students will on lab sheets (6L1 & 6L2): a. Decode a resistor b. Decode its tolerance c. Measure the resistor to determine its actual value d. Determine if the resistor is good or bad

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UNIT #7: Circuits, Symbols, and Components

GOAL: Students will show knowledge and understand what electronic circuits, symbols, and components are and how they are used in the field of electricity/electronics.

OBJECTIVES The student will:	ACTIVITIES
1. Demonstrate ability to correctly identify the difference between a schematic and a wiring diagram and their functions as evidenced by a written teacher made test.	1. Students will be working with many schematics in lab to learn how symbols are used to show the builder how to fabricate a circuit.
2. Demonstrate ability to draw and label common symbols used in the field of electronics by passing a written teacher made test.(7Q1)	2. Students will be using worksheets to reinforce their ability to recognize various symbols used in electronics. (7I1, 7I2, 7W1)

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UNIT #8: Reading a Schematic

GOAL: Students will be able to successfully read a schematic for the purpose of fabricating a small electronic project.

OBJECTIVES The student will:	ACTIVITIES
1. Demonstrate ability to identify electronic parts and where they are connected together by doing so on a schematic. This will be turned in and graded by the teacher.	1. Each student will do many worksheets to learn how a schematic is used to aid a person to build or trouble-shoot an electronic component.
2. Demonstrate ability to transfer the knowledge above to a printed circuit board by successfully completing a project.	2. Each student will build an electronic project given only a parts bag, schematic, and a printed circuit board.

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UNIT #9: Fabrication

GOAL: Students will be able to fabricate a project from a parts list and a schematic.

OBJECTIVES The student will:	ACTIVITIES
1. Demonstrate ability to methodically fabricate parts together on a p.c. board by completing a working electronic device.	1. Each student will follow a step-by-step procedure (9I1) while building an electronic project.
2. Demonstrate knowledge of simple trouble shooting techniques by correctly answering questions given to them by the teacher.	2. Students will be trouble-shooting simple problems that they encounter if & when their project does not work.

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UNIT #10: Math review and using the Multi-Function Calculator

GOAL: Students will know how to use a Multi-Function Calculator.

OBJECTIVES The student will:	ACTIVITIES
1. Demonstrate the ability to calculate and understand simple arithmetic and algebraic problems by passing written teacher made tests.	1. Students will take a pre-test and a post-test to determine what math skills they need to learn for the up-coming D.C. Evaluation unit. This is an individualized learning unit and students who demonstrate higher skills through written tests will practice their trouble-shooting skills with the extra time that they will have.
2. Demonstrate ability to store, recall, and exchange numbers on a multi-function calculator by doing so on various lab assignments and written teacher made tests.	2. Appropriate worksheets will be done by those students who need to practice on the following math concepts: a. Negative numbers b. Powers of Ten c. Scientific Notation d. Engineering Notation e. Simple Equations f. Formula Substitution

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UNIT #11: D.C. Circuit Evaluation (This unit will take 40-50 hours to complete)

OBJECTIVES The student will:	ACTIVITIES
1. Demonstrate knowledge of Ohm's Law and Watt's Law by passing a written and practical teacher made test.	1. Each student will do many worksheets a lab assignments before taking tests for evaluation of learning.
2. Demonstrate ability to evaluate series, parallel, and combination D.C. circuits by passing a written teacher made test on each of the circuits.	2. Each student will be completing at least 5-10 worksheets, 2-4 quizzes, and 1-3 lab assignment in each of the 3 areas listed at the right.
3. Demonstrate ability to read schematics of series, parallel, and combination circuits by successfully connecting them up in a lab. Voltage, current, and resistance measurements will be taken by the student and graded by the teacher.	3. Each student will complete 8 or more highly complex circuit worksheets (11K1-11K17) before taking a teacher made test for evaluation of learning.

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UNIT #12: Methods to Produce Electricity

OBJECTIVES The student will:	ACTIVITIES
1. Demonstrate knowledge of the 6 methods used to produce electricity by passing a written teacher made test.	1. Students will watch a teacher demonstration, take notes, and pass a written quiz.
2. Demonstrate knowledge of how electricity is brought to the home and the dangers to avoid. Learning will be evaluated by a written teacher made test.	2. Each student will listen to guest lecturers and/or watch a filmstrip on how P.G.& E. and other power companies provide us electricity.

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UNIT #13: Careers and Job Preparation

GOAL: Students will show an understanding of the types of employment that they can receive in electronics and how to present themselves to a perspective employer.

OBJECTIVES The student will:	ACTIVITIES
1. Demonstrate knowledge of how to fill out an application for employment by turning in one to the instructor for grading.	1. Students take notes during a lecture and practice filling out applications. A final application will be required and graded.
2. Show knowledge of the various jobs available related to electronics by having compiled lists in their portfolios.	2. Students will spend time in the career center compiling a list of possible employers in the field of electronics. This list will be required to be in their portfolio which will be graded.

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UNIT #14: A.C. Fundamentals

GOAL: Students will show knowledge of alternating current (A.C.) fundamentals.

OBJECTIVES The student will:	ACTIVITIES
1. Demonstrate knowledge of A.C. fundamentals by passing a written teacher made test.	1. Students will reinforce the following concepts by observing on the oscilloscope: a. Peak voltage b. Peak-to-peak voltage c. Effective voltage (RMS) d. Average voltage
2. Demonstrate understanding of a sine wave and its parts by graphing and labeling one to be turned in and graded by the teacher.	1. Students will reinforce the following concepts by observing on the oscilloscope: a. Period b. Frequency c. Wavelength

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UNIT #15: Instrumentation

GOAL: Students will be able to use an oscilloscope and a signal generator to measure voltage and frequency.

OBJECTIVES The student will:	ACTIVITIES
1. Demonstrate ability to correctly use the oscilloscope and the frequency generator by doing so in conjunction with their lab assignments to be observed and graded by the teacher.	1. Each student will complete worksheets and lab assignments on the following: a. Orientation and safe operation b. Measuring voltage c. Measuring frequency
2. Demonstrate ability to measure an unknown voltage and frequency by doing so on a practical teacher made test.	2. Students will use the oscilloscope and frequency generator to demonstrate: a. Voltage control b. Frequency range

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UNIT #16: Concepts in Sound Reinforcement

GOAL: Students will know and understand the basics of an amplified sound system.

OBJECTIVES The student will:	ACTIVITIES
1. Demonstrate knowledge of various sound related components by passing a teacher made written test.	1. After lecture note taking, watching demonstration(s), & reading a sound packet each student will recognize the following and their functions in the sound playback & recording: a. Power amplifier b. Pre-amplifier c. Mixers d. Equalizers, etc.
2. Show knowledge of the importance of good cables.	2. Each student will observe, show competence by doing, & train other students in the art of cable construction & routing by knowing: a. Types of cables b. Their construction c. Strain relief d. Connectors
3. Demonstrate knowledge of techniques used in good sound reinforcement.	3. Students will hookup and operate various types of sound systems both in and out of the sound studio.

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UNIT #17: Musical Instrument Digital Interface (MIDI)

GOAL: Students will learn the basic of interfacing and the practical application of MIDI.

OBJECTIVES The student will:	ACTIVITIES
1. Show an knowledge of what MIDI is and the reason for it's use in playback and recording.	1. Students will take notes on Instructional lectures and do worksheets to increase their knowledge of MIDI.
2. Demonstrate an understanding of MIDI hookup.	2. Each student will do teacher made lab experiences. These experiences will included the hookup and operation of MIDI devices in and out of the sound studio.

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UNIT #18: Maintenance, Trouble Shooting, & Repair

GOAL: Students will show knowledge of simple trouble shooting procedures.

OBJECTIVES The student will:	ACTIVITIES
1. Demonstrate knowledge of basic trouble shooting procedures by passing a written teacher made test.	1. Each student will be given an assignment sheet that they will complete in the lab stations. This sheet will walk them through common trouble-shooting procedures.
2. Demonstrate ability to make simple trouble shooting repairs by doing so on an electronic device to be observed and graded by the teacher.	2. Student will use the above knowledge to enhance their skills while repairing electronic components in the shop. After doing so, they will fill out a repair bill to be graded by the teacher.

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UNIT #19: Practical Recording Techniques

GOAL: The student will learn to use a step-by-step approach to professional recording.

OBJECTIVES The student will:	ACTIVITIES
1. Show knowledge of various recording terms by correctly identifying them to the teacher.	1. Students will do: a. Lecture note taking b. Teacher made worksheets c. Teacher made quizzes
2. Demonstrate ability to correctly hookup and operate recording equipment by making an actual tape recording.	2. After completing the above each student will use recording equipment to make a recording. The tape will be graded by the instructor..
3. Show an understanding of the multi-track recorder by recording and mixing sound in the sound studio.	3. When the student has completed steps 1 & 2 from above he or she will do a multi-track recording which will be grade by the teacher.

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UNIT #20: Printed Circuit Graphics & Design

GOAL: Students will show knowledge designing and building a P.C. board.

OBJECTIVES The student will:	ACTIVITIES
1. Demonstrate knowledge printed circuit design fundamentals used in industry by passing a written teacher made test.	1. Students will reinforce the printed circuit design concepts by: a. Taking lecture notes. b. Doing extensive practice of many simple circuits. c. Designing a P.C. circuit board from only a schematic.
2. Demonstrate the ability to use the correct standards by properly laying out a printed circuit board.	2. Each student will use the above acquired knowledge and prior units to build a P.C. board and complete a working project that will be graded by the instructor.

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UNIT #21: The Art of Sequencing

GOAL: The student will be able to use sequencing techniques to combine recorded tracks in the sound studio.

OBJECTIVES The student will:	ACTIVITIES
1. Show knowledge of what a sound sequencer is and does by passing a teacher made test.	1. Students will do: a. Lecture note taking b. Teacher made worksheets c. Teacher made quizzes
2. Demonstrate the ability to correctly operate a sequencer by adding two or more pre-recorded tracks to put together a song.	2. Each student will ping-pong and bounce pre-recorded tracks to develop a song.

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UNIT #22: Using the Computer for Automation Processing

GOAL: The student will be able to use the computer to process sound signals.

OBJECTIVES The student will:	ACTIVITIES
1. Show knowledge and understanding of basic computer operation by using it to process sound.	1. The student will learn and demonstrate basic operational procedures while using a P.C. computer.
2. Show a basic understanding of Windows 96 by passing on oral test.	2. The student will read and apply Windows 96 basic operational data.
3. Show knowledge of automated sound techniques by using a computer to process sound.	3. Using a Pentium computer and the above acquired knowledge in this unit & unit 22 each student will process sound automatically.

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Course: Basic Electronics

"Big Idea" (Theme)

Students will know how to fabricate and assemble a project.

State/National Standards

1: Fabrication and Assembly

Give examples of student work that demonstrates mastery of this standard

Students will complete an electronic project using the proper industrial tools and electronic components. They will use the knowledge from prior learned units.

Identify best practices used to teach standard

The teacher will use: Lectures, demonstrations, worksheet, a computer program on the network in the electronics room called "Electronic Workbench" (EWB), and written and oral quizzes.

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"Big Idea" (Theme)

Students will be able to identify parts for: Assembly, trouble-shooting, and testing.

State/National Standards

3: Identifying electronic components.

Give examples of student work that demonstrates mastery of this standard

Students will identify many different components as needed to assemble their electronic project. Students will take a teacher made quiz.

Identify best practices used to teach standard

The teacher will use: Lectures, demonstrations, worksheet, a computer program on the network in the electronics room called "Electronic Workbench" (EWB), and written and oral quizzes.

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"Big Idea" (Theme)

Students will have a theoretical and working knowledge of Direct Current (D.C.) circuits.

State/National Standards

4: Direct Current (D.C.) circuits

Give examples of student work that demonstrates mastery of this standard

Students will: Complete many worksheets on series, parallel, and combination circuits.
Hookup and measure series, parallel, and combination circuits both on the computer and physically in the Lab.

Pass teacher made quizzes on series, parallel, and combination circuits.

Identify best practices used to teach standard

The teacher will use: Lectures, demonstrations, worksheet, a computer program on the network in the electronics room called "Electronic Workbench" (EWB), and written and oral quizzes.

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Course: Basic Electronics

"Big Idea" (Theme)

Students will understand Ohm's Law and the interactive, measurable team of electricity: voltage, current, resistance, and power. They will show knowledge of them based on measurements made with electronic test equipment.

State/National Standards

5: Units of measure.

Give examples of student work that demonstrates mastery of this standard

Students will: Complete many worksheets on Ohm's and Watt's Laws.
Hookup and measure circuits both on the computer and physically in the Lab and make learning evaluations on the two laws.

Pass teacher made quizzes on Ohm's and Watt's Laws.

Identify best practices used to teach standard

The teacher will use: Lectures, demonstrations, worksheet, a computer program on the network in the electronics room called "Electronic Workbench" (EWB), and written and oral quizzes.

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Course: Basic Electronics

"Big Idea" (Theme)

Students will know how electricity is produced.

State/National Standards

7: Sources of Electromotive Force

Give examples of student work that demonstrates mastery of this standard

Students will: Take notes on lectures and demonstrations for reference.
Be quizzed on those notes.
Do many lab experiences related to the above.

Identify best practices used to teach standard

The teacher will use: Lectures, demonstrations, worksheet, a computer program on the network in the electronics room called "Electronic Workbench" (EWB), and written and oral quizzes.

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"Big Idea" (Theme)

The student will know the basic operational theory and application of diodes and transistors.

State/National Standards

10: Solid-State Devices

Give examples of student work that demonstrates mastery of this standard

Students will test diodes and transistors to differentiate: Good from bad.
(Using an appropriate multi-meter such as Simpson 260) Diodes from resistors.
NPN from PNP

Identify best practices used to teach standard

The teacher will use: Lectures, demonstrations, worksheet, a computer program on the network in the electronics room called "Electronic Workbench" (EWB), and written and oral quizzes.

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"Big Idea" (Theme)

Students will understand the theory and functions and know how to use basic electronic test equipment.

State/National Standards

15: Instrumentation.

Give examples of student work that demonstrates mastery of this standard

Students will: Complete many worksheets on test equipment.

Hookup and measure circuits using various testing devices both physically in the lab and on the computer using EWB.

Pass teacher made quizzes on the theory and operation of specific electronic test equipment.

Identify best practices used to teach standard

The teacher will use: Lectures, demonstrations, worksheet, a computer program on the network in the electronics room called "Electronic Workbench" (EWB), and written and oral quizzes.