



# ELECTRONIC TECHNOLOGIES

## 14.1001.00

### TECHNICAL STANDARDS

An Industry Technical Standards Validation Committee developed and validated these standards on March 17, 2017. The Arizona Career and Technical Education Quality Commission, the validating authority for the Arizona Skills Standards Assessment System, endorsed these standards on May 24, 2017.

Note: Arizona's Professional Skills are taught as an integral part of the Electronic Technologies program.

**The Technical Skills Assessment for Electronic Technologies is available SY2017-2018.**

Note: In this document i.e. explains or clarifies the content and e.g. provides examples of the content that must be taught.

#### STANDARD 1.0 PRACTICE SAFE WORKING PROCEDURES IN THE ELECTRONIC TECHNOLOGY ENVIRONMENT

- 1.1 Identify safety precautions for common workplace hazards including OSHA regulations (e.g., types of fires and fire extinguishers and good housekeeping standards)
- 1.2 Describe personal safety clothing, gear, and equipment
- 1.3 Explain hazardous materials (HAZMAT) procedures
- 1.4 Demonstrate appropriate lifting methods
- 1.5 Demonstrate safe use, storage, and maintenance of tools and equipment
- 1.6 Describe ESD (electrostatic discharge) and protection methods

#### STANDARD 2.0 APPLY MATHEMATICAL PROCESSES TO PROBLEMS IN ELECTRONIC TECHNOLOGY

- 2.1 Use numeric, symbolic, and/or graphic representations to express problems
- 2.2 Perform mathematical calculations
- 2.3 Solve basic arithmetic equations and identify the relationship/dependency of variables within the equation (i.e., as "x" value increases, "z" value decreases as a result of..., etc.)

#### STANDARD 3.0 APPLY MEASUREMENT TECHNIQUES TO PROBLEMS IN ELECTRONIC TECHNOLOGY

- 3.1 Identify common measurement tools and their functions used in electronic technology
- 3.2 Select and use an appropriate measurement technique for a specific measurement need
- 3.3 Explain the differences among theoretical versus simulation versus real-world tests

#### STANDARD 4.0 DEMONSTRATE UNDERSTANDING OF SCHEMATICS, BLUEPRINTS, TECHNICAL DRAWINGS, AND RELATED VOCABULARY UTILIZED IN ELECTRONIC TECHNOLOGY

- 4.1 Interpret dimensions, symbols, legends, scales, and directions on technical drawings, blueprints, and schematics
- 4.2 Demonstrate drawing and visualization skills including the use of CAD tools used in the electronic technology field
- 4.3 Use appropriate electronic vocabulary

#### STANDARD 5.0 DETERMINE ELECTRICAL QUANTITIES, UNITS, AND CIRCUITS

- 5.1 Describe atomic structure, components of the atom and their charges, and their importance to electronic technology
- 5.2 Identify common electrical components, quantities, and units
- 5.3 Explain voltage, current, resistance, and continuity in electric circuits
- 5.4 Calculate and apply Ohm's law and Kirchoff's law, energy and power
- 5.5 Build DC series, parallel, and series parallel circuits, and make measurements
- 5.6 Build a simple electronic circuit/device/component to solve a simulated scenario

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## **STANDARD 6.0 APPLY FUNDAMENTALS OF ALTERNATING CURRENT (AC)**

- 6.1 Explain alternating current and voltage in terms of VRMS and peak to peak
- 6.2 Describe  $V_{pp}$ ,  $V_p$ , VRMS, and  $V_{ave}$  as related to an AC waveform

## **STANDARD 7.0 SOLVE MAGNETISM AND ELECTROMAGNETISM CIRCUIT PROBLEMS**

- 7.1 Explain magnetism, magnets, magnetic fields, flux and poles, and electromagnetism
- 7.2 Analyze magnetic circuit problems using magnetic quantities and units

## **STANDARD 8.0 ASSEMBLE RC, RL, AND RCL CIRCUITS**

- 8.1 Calculate impedance and phase angle for RC, RL, and RCL circuits when the components are connected in either series or parallel including time constant
- 8.2 Calculate the resonant frequency, the quality factor, and the bandwidth of LC circuits
- 8.3 Perform circuit analysis on RC, RL, and RCL circuits including time constant
- 8.4 Build AC series, parallel, and series parallel circuits, and make measurements

## **STANDARD 9.0 EXPLAIN TRANSFORMERS**

- 9.1 Demonstrate transformer theory
- 9.2 Determine the transformer ratings that are appropriate for the job
- 9.3 Connect transformer windings in series and/or parallel to obtain the desired voltage and current capabilities through calculations and measurements

## **STANDARD 10.0 CALCULATE AND BUILD POWER SUPPLIES PROBLEMS**

- 10.1 Describe how common rectifier circuits work
- 10.2 Calculate power-supply ripple percentage and voltage regulation
- 10.3 Calculate the DC output voltage for filtered and unfiltered power supplies
- 10.4 Build a simple linear power supply and make measurements

## **STANDARD 11.0 DESCRIBE ELECTRIC MOTORS AND THEIR USE IN ELECTRONICS**

- 11.1 Describe basic DC and AC motor theory
- 11.2 Explain the characteristics single phase, 3 phase, and DC motors

## **STANDARD 12.0 CONSTRUCT AND ANALYZE DIODES, SEMICONDUCTORS, AND CONTROL CIRCUITS**

- 12.1 Describe insulators, conductors, N- and P-types, diodes, semiconductors, and transistors and the effect of temperature
- 12.2 Explain the operation of thyristors and relays in a control circuit
- 12.3 Illustrate the directions of electron and hole currents in semiconductors
- 12.4 Describe and estimate decibel gain and loss of amplifiers and power gain
- 12.5 Calculate biasing of transistor currents (cutoff, saturation, and linear region)
- 12.6 Build a transistor circuit and a diode circuit (including LEDs and photo diodes) and make measurements using an oscilloscope and DMM (digital multimeter)
- 12.7 Explain the importance of impedance matching
- 12.8 Investigate cascade amplifiers and calculate voltage gain
- 12.9 Troubleshoot circuits for component-level defects

## **STANDARD 13.0 INVESTIGATE FREQUENCY OSCILLATORS**

- 13.1 Compare and contrast frequency oscillator configurations
- 13.2 Build a 555 timer-based oscillator and make frequency measurements

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## **STANDARD 14.0 ANALYZE INTEGRATED CIRCUIT TECHNOLOGY**

- 14.1 Compare and contrast op-amp circuit configurations
- 14.2 Build operational-amplifier circuits and make voltage-gain measurements

## **STANDARD 15.0 ANALYZE SIGNAL PROCESSING CIRCUITS**

- 15.1 Build combinational and sequential logic circuits using flip-flops and predict/describe/verify operations
- 15.2 Explain the operation of serial and parallel shift registers and compare attributes of each
- 15.3 Explain operation of A-D converters, D-A converters
- 15.4 Describe modulation and demodulation

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