

# Draft Electronics Standards

## *Part I - Core Standards*

### **1. Safety**

Students will understand requirements of personal and equipment safety in the working environment. They will demonstrate content proficiency by:

- Passing a written safety test.
- Creating a safety checklist.
- Helping to develop safety policies based on classroom events and observations.
- Completing tasks while maintaining a safe environment.

### **2. History of Electricity and Electronics**

The student will understand the historical developments in electricity and electronics. They will demonstrate content proficiency by:

- Creating a time line that depicts developments in technology.
- Explaining the major events of historical developments as they relate to current technology.

### **3. Units of Measure**

Students will understand the use of electronic test equipment and units of measure. They will demonstrate content proficiency by:

- Selecting and applying appropriate equipment or tools.
- Analyzing and applying observed measurements.
- Utilizing engineering notation in unit conversion.

### **4. Mathematics for Electronics**

Students will understand the mathematical processes and applications that lead to solutions of electronic problems. They will demonstrate content proficiency by:

- Solving Direct-Current (DC) circuit analysis problems using Ohm's Law.
- Calculating fundamental Alternating Current (AC) parameters.
- Manipulating scientific notation in problem solutions.
- Manipulating engineering notation in problem solutions.
- Deriving algebraic equations to determine unknown values in circuits.
- Utilizing a scientific calculator as a tool for problem solving.
- Solving multi-step problems including word problems using linear equations in one variable.

### **5. Science of Electricity and Electronics**

Students will understand fundamental scientific principles involved in electricity and electronics. They will demonstrate content proficiency by:

- Describing the relationships between atomic structure of the atom, electricity, electronics and the periodic table of elements.
- Clarifying the differences between conventional theory and electron theory.
- Defining the Laws of Charges and Magnetism
- Completing a project incorporating the conductive and insulative properties of electron flow.
- Converting electricity from friction, chemical, solar, pressure, mechanical (magnetism), and thermal sources.
- Explaining the differences between electron flow and hole flow as it occurs in semiconductor materials.

## **6. Electronic Components**

Students will discern characteristics of commonly used electronic components. They will demonstrate content proficiency by:

- Identifying symbols and component characteristics.
- Determining resistor's values by identifying color codes
- Drawing schematic diagrams.
- Using diagrams to interpret circuit characteristics.
- Utilizing cross-reference resources.

## **7. Direct-Current (DC) Circuits**

The students will understand relationships between voltage, current, resistance and power as pertaining to direct-current circuits. They will demonstrate content proficiency by:

- Calculating solutions to Ohm's Law problems.
- Constructing and measuring sample DC circuits.
- Comparing predicted outcomes to measured outcomes with lab activities.
- Analyzing data gathered from simple and complex DC circuits.

## **8. Alternating-Current (AC) Circuits**

The students will understand the theory of alternating current. They will demonstrate content proficiency by:

- Defining the terms and measurements associated with an AC sine wave.
- Using an oscilloscope to observe a sine wave to calculate pertinent values.
- Comparing an oscilloscope measurement of a sine wave to measurements made by other instruments.

## **9. Introduction to Digital Electronics**

The students will understand fundamental concepts of digital electronics. They will demonstrate content proficiency by:

- Drawing and labeling the seven basic logic gates
- Deriving the truth tables of the seven basic logic gates.
- Constructing logic circuits using discrete components to emulate the seven basic gates.

## **10. Electronic Assembly**

The students will understand the procedures and processes related to electronic assembly. They will demonstrate content proficiency by:

- Constructing an electronic device following a schematic diagram as a sole reference.
- Demonstrating the ability to use soldering techniques.
- Identifying tools commonly used in the electronic assembly.
- Using tools for their intended applications.

## **11. Employability Skills**

The students will understand how the development of personal skills affects their employability. They will demonstrate content proficiency by:

- Exhibiting positive attitudes, self-confidence, honesty, perseverance, self-discipline, and personal hygiene.
- Researching and identifying career paths and strategies for obtaining employment.
- Applying the principles of effective communication to convey and obtain information.
- Exhibiting critical and creative logical reasoning and problem solving skills.

## ***Part II - Content Standards***

### **12. Alternating Current (AC) Circuits**

The student will understand how the principles and concepts of alternating current (AC) is generated and applied in electrical and electronic devices. They will demonstrate content proficiency by:

- Identifying the parts of a waveform.
- Calculating frequencies and associated amplitude levels using an oscilloscope.
- Defining the (AC) characteristics of tuned and resonant circuits.
- Analyzing properties of waveforms.
- Measuring frequency with test equipment.
- Using calculations and the principles of (AC) to design circuits.
- Describing the properties of the frequency spectrum.

### **13. Motors and Generators**

Students will understand the principles, concepts and applications of motors and generators. They will demonstrate content proficiency by:

- Explaining how mechanical energy can be converted to electrical energy.
- Identifying types of generators.
- Describing the construction and function of a generator.
- Plotting a sine wave in relation to how it is generated.
- Comparing generators to motors.
- Listing the types of DC motors.
- Describing the characteristics of (AC) motors.

### **14. Active Devices**

Students will understand the fundamentals of the science of semiconductors, and the characteristics and uses of active devices. They will demonstrate content proficiency by:

- Researching and reporting in the fundamentals of the science of semiconductors.
- Constructing circuits using active devices.
- Identifying active devices and their uses.
- Designing circuits utilizing mathematical and scientific concepts of active devices.
- Utilizing discrete active devices to emulate integrated circuits.

### **15. Digital Electronics**

Students will understand the concepts of logic and sequential digital electronic circuits. They will demonstrate content proficiency by:

- Defining logic and sequential circuits.
- Constructing both logic and sequential circuits for a given application.
- Exploring logic functions and memory circuits through lab activities.
- Troubleshooting digital systems to the individual chip level.
- Explaining the operation of digital logic gates.
- Naming the major components used in implementing digital circuits.

## **16. Instrumentation**

Students will understand how electrical and electronic instruments are used to test, analyze and repair electrical and electronics systems. They will demonstrate content proficiency by:

- Selecting and using proper instruments to make measurements of circuit parameters.
- Applying the fundamental theories of analog and digital instruments to test and analyze electrical and electronic systems.
- Referencing the measurement benchmarks as outlined in the National Institute of Standards of Technology (NIST).
- Obtaining resolution and accuracy in reading, interpreting and calibrating selected instruments.
- Describing analog to digital (A to D) and digital to analog (D to A) conversions as applied to instruments.

## **17. Industrial Electronics**

Students will understand the principles of electronics systems used in industrial applications. They will demonstrate content proficiency by:

- Utilizing transducers, sensors and electromechanical controllers.
- Applying the theory of (AC),(DC) and stepper motors and their controls.
- Diagnosing and designing ways to solve industrial electrical problems to restore operations or increase systems' performance.
- Fabricating electrical systems utilizing industrial programmable logic controllers

## **18. Residential Wiring**

Students will understand and have a fundamental knowledge of electrical wiring principles, common practices and the National Electrical Code as they pertain to residential wiring. They will demonstrate content proficiency by:

- Fabricating electrical circuits that meet applicable codes and industry standards.
- Reading and interpreting blue prints and wiring diagrams.
- Wiring electrical power, signaling and automation circuits.
- Utilizing electrical instruments to troubleshoot electrical circuits.

## **19. Computer Systems**

The student will understand fundamental hardware and software applications in computer systems. They will demonstrate content proficiency by:

- Identifying hardware components of a given system.
- Describing the operation of a microprocessor.
- Analyzing system operation to determine the functional status.
- Restoring a computer system by identifying and correcting faults.

- Applying the proper software to operate the computer system.
- Using software diagnostics to troubleshoot the computer system.
- Writing, storing, editing, and retrieving programs to solve electronic and mathematical problems
- Identifying the major Electronic Industries Association (EIA) and Institute of Electrical and Electronic Engineers (IEEE) standards currently in use for synchronous (SYNC) and asynchronous (ASYNC) devices; network levels; protocols; and packet switching.
- Assembling and preparing a personal computer (PC) for an end user.

## **20. Home and Consumer Product Servicing**

Students will understand entertainment, appliance and control systems. They will demonstrate content proficiency by:

- Performing basic troubleshooting techniques on home and consumer products.
- Completing repair order.
- Estimating repair costs.
- Procuring components to facilitate restoration.

## **21. Automation**

Students will understand fundamental automation modules and systems. They will demonstrate content proficiency by:

- Identifying terminology and devices used in automated systems.
- Using computer programs to control an automated system.
- Utilizing selected sensors for inputs.
- Utilizing selected motors and other devices as outputs.
- Assembling and testing an automated module.

## **22. Microelectronics**

Students will understand the processes associated with microelectronic technology. They will demonstrate content proficiency by:

- Identifying terminology and devices included in the field of microelectronics.
- Planning a process that could result in the manufacture of a microelectronic device.
- Fabricating a device that utilizes surface mount technology (SMT).

## **23. Optoelectronics**

Students will understand the fundamentals of optoelectronic circuitry, the properties of light, light sources, light amplification and the integration of optical systems into electronic systems. They will

demonstrate content proficiency by:

- Analyzing the properties of light.
- Listing light sources.
- Defining fundamental optical terms and concepts.
- Listing and describing the types of optoelectronic displays and their driver and multiplexing requirements.
- Analyzing the principles, characteristics and operations of light reactive devices.
- Describing the theory and operation of a fiber optic communications link.