

# ELECTRONICS APPLICATIONS & TECHNOLOGY BLUEPRINT

This Blueprint contains the subject matter content of this Skill Connect Assessment. This Blueprint does **NOT** contain the information one would need to fully prepare for a SkillsUSA Championships contest. Please refer to the *SkillsUSA Championships Technical Standards* CD-ROM for the current year or purchase and download the relevant "Contest Singles." Both are available through [www.skillsusa.org](http://www.skillsusa.org) > Shop > Educational Materials Catalog.

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## Standards and Competencies

### **Demonstrate knowledge of general electronics that apply to NCEE Basic Electronics Competencies**

- Describe DC circuits
- Describe AC circuits
- Describe discrete solid state devices
- Describe analog circuits
- Describe digital circuits
- Describe microprocessors and microcomputers

### **Diagnose and service electronic circuits using related NCEE Basic Electronics Competencies**

- Read and understand the manufacturer's training literature about the circuit
- Use test equipment to make specified measurements
- Follow recommended manufacturer's troubleshooting and sequence of procedures
- Identify the problem
- Identify the defective component(s)
- Repair defective component using appropriate procedure

### **Demonstrate soldering and desoldering techniques using related NCEE Basic Electronics competencies**

- Describe solder safety as it pertains to burns and potential fires or damage to facilities and customer products
- List causes and precautions to prevent or reduce solder splatter
- Explain the reasons for flux usage and describe types
- List types of solder and reasons for choosing each
- Demonstrate the use of heat shunts
- Demonstrate the use of cold solder joints
- Demonstrate the use of braid-wick solder removers

### **Demonstrate safety and ESD procedures using NCEE Basic Electronics competencies**

- Describe the physiological reactions electrical shock causes
  - List various degrees of current the human body can tolerate
- Explain the concept of first aid and its particular importance to workers in electric and electronics fields
  - Explain precautions for untrained people
- Explain the National Electric Code, and describe various rules technicians must abide by
- Explain NFPA rules, and describe how technicians comply and may violate them
- Describe fusing and circuit breaker rules and reasons for different type of fuses
- Explain static causes and CMOS damage prevention straps, mats and grounding
- List tool hazards which are associated with technician activities in the workplace and in the field.
- Describe lockout and tagging rules for potentially unsafe electrical or mechanical hazards
- Explain RF transmitter hazards and precautions

- List fiber optics hazards to skin and eyes
- Explain eye and ear protection needed by technicians
- List ladder handling/usage and OSHA heights safety rules
- Describe the types and usage of fire extinguishers

**Exhibit customer service skills using related competencies for NCEE Customer Service Specialist**

- Show actions that demonstrate respect for customer
- Use active listening skills when working with a customer
- Elicit feedback from a customer in a service situation
- Use questioning skills to discover customer needs and issues
- Demonstrate professional behaviors when working with customer
- Use methods of resolving conflicts with customers

**Analyze a linear amplifier system using related competencies for NCCE Basic Electronics**

- List common amplifier devices
- Describe the purpose of each component in an amplifier circuit
- List the usages and classes of amplifiers
- Describe biasing and gain characteristics
- Explain frequency response of an amplifier circuit and why it is important
- Explain the words “preamplifier” and “line amplifier” and where these units are commonly used
- Explain the uses of operational amplifiers and how they differ from other amplifiers
- Show causes of distortion in amplifiers and list ways to reduce or eliminate it
- Explain how inaccurate measurements can be experienced due to meter or score loading
  - List ways to overcome loading problems
- Describe specifications for broadband amplifiers as compared with common narrow band units
- Explain the operation of high power electron tubes

**Analyze a microprocessor system using digital technology using related competencies for NCCE Basic Electronics**

- Describe ASCII code
- Identify each basic digital gate
- Construct truth tables for common gates
- Explain how counters operate
- Explain the purpose of flip flops, and list common types
- Explain the purpose of a digital bus, and show how it is connected to various sections of a product
- List types of display circuitry, and describe how numbers and letters are activated digitally
- Explain the purpose of computer clocks
- Show how pulsers are used for digital signal tracing and how logic probes are used to verify states in digital equipment
- Describe digital clock usage and circuitry
- Describe how microprocessors function, and identify the basic components and pinouts
- Describe the major sections of a computer
- Demonstrate how the computer block diagram and flow charts are utilized
- Sketch the major blocks contained in a microprocessor chip, and describe the purpose of each block
- Describe different types of computer memory and how storage is accomplished
- Explain programmable logic controls (PLCs), and list usages
- Describe basic programming concepts
- Describe the reasons for different computer languages and their relationships
- Define the word “peripheral” and list various types
- Explain the reasons for using interface devices/chips/cards and name common types

**Analyze a communications system using related competencies from NCCE Basic Electronics**

- List common electronics display devices
- Explain the operation of a kinescope
- Explain how LCD displays operate, and state their advantages and disadvantages

- Explain the basics of electronic cameras and sensors
- Describe how LED remote hand units work
- Describe plasma TV technology and its uses in TV and computer displays
- Explain why and list some locations of circuits in which opto isolators are used
- List uses for light activated controls and how photo devices are incorporated
- Describe how broadband signal RF and optical links are used
- Describe major types of two-way radio communications (avionics, land mobile, maritime, etc.)
- Describe wireless telephone/video/data technology basics, and list the TIA-EIA standard which applies
- Describe satellite communications principles
- Describe wired data and voice communications network technology

**Assemble an electronics project with provided instructions and materials using related NCEE Basic Electronics competencies**

- Read and interpret directions
- Plan effective use of time
- Determine correct sequence of activities and tasks
- Follow approved procedures
- Evaluate success of efforts

**Committee Identified Academic Skills**

The SkillsUSA national technical committee has identified that the following academic skills are embedded in the electronics applications training program and assessment:

**Math Skills**

- Use fractions to solve practical problems
- Use proportions and ratios to solve practical problems
- Simplify numerical expressions
- Use scientific notation
- Solve practical problems involving percents
- Solve single variable algebraic expressions
- Solve multiple variable algebraic expressions
- Measure angles
- Make comparisons, predictions and inferences using graphs and charts
- Organize and describe data using matrixes
- Graph linear equations
- Solve problems using proportions, formulas and functions
- Use laws of exponents to perform operations
- Solve practical problems involving complementary, supplementary and congruent angles

**Science Skills**

- Plan and conduct a scientific investigation
- Use knowledge of carbon, water and nitrogen cycles
- Use knowledge of the particle theory of matter
- Describe and recognize elements, compounds, mixtures, acids, bases and salts
- Describe and recognize solids, liquids and gases
- Describe characteristics of types of matter based on physical and chemical properties
- Describe phases of matter
- Describe and identify physical changes to matter
- Use knowledge of physical properties (shape, density, solubility, odor, melting point, boiling point, color)
- Use knowledge of chemical properties (acidity, basicity, combustibility, reactivity)
- Understand the modern model of atomic structure
- Understand Law of Conservation of Matter and Energy

- Use knowledge of classification of elements as metals, metalloids and nonmetals
- Use knowledge of potential and kinetic energy
- Use knowledge of mechanical, chemical and electrical energy
- Use knowledge of heat, light and sound energy
- Use knowledge of temperature scales, heat and heat transfer
- Use knowledge of sound and technological applications of sound waves
- Use knowledge of speed, velocity and acceleration
- Use knowledge of simple machines, compound machines, powered vehicles, rockets and restraining devices
- Use knowledge of principles of electricity and magnetism
- Use knowledge of static electricity, current electricity and circuits
- Use knowledge of magnetic fields and electromagnets
- Use knowledge of motors and generators
- Use knowledge of work, force, mechanical advantage, efficiency and power

### **Language Arts Skills**

- Provide information in conversations and in group discussions
- Demonstrate use of verbal communication skills: word choice, pitch, feeling, tone and voice
- Demonstrate comprehension of a variety of informational texts
- Use text structures to aid comprehension
- Understand source, viewpoint and purpose of texts
- Demonstrate knowledge of appropriate reference materials
- Use print, electronic databases and online resources to access information in books and articles
- Demonstrate narrative writing
- Demonstrate expository writing
- Demonstrate informational writing

### **Connections to National Standards**

State-level academic curriculum specialists identified the following connections to national academic standards.

#### **Math Standards**

- Numbers and operations
- Algebra
- Geometry
- Measurement
- Data analysis and probability
- Problem solving and proof
- Reasoning and proof
- Communication
- Connections
- Representation

**Source:** NCTM Principles and Standards for School Mathematics. To view high school standards, visit: [standards.nctm.org/document/chapter7/index.htm](http://standards.nctm.org/document/chapter7/index.htm). Select “Standards” from menu.

#### **Science Standards**

- Understands the structure and properties of matter
- Understands the sources and properties of energy
- Understands forces and motion
- Understands the nature of scientific inquiry
- Understands the scientific enterprise

**Source:** McREL compendium of national science standards. To view and search the compendium, visit: [www.mcrel.org/standards-benchmarks/](http://www.mcrel.org/standards-benchmarks/).

### **Language Arts Standards**

- Students read a wide range of print and nonprint texts to build an understanding of texts, of themselves, and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace; and for personal fulfillment. Among these texts are fiction and nonfiction, classic and contemporary works
- Students apply a wide range of strategies to comprehend, interpret, evaluate and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies, and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics)
- Students adjust their use of spoken, written and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes
- Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience
- Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge
- Students use spoken, written and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion and the exchange of information)
- Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language and genre to create, critique and discuss print and non-print texts

**Source:** IRA/NCTE Standards for the English Language Arts. To view the standards, visit: [www.readwritethink.org/standards/index.html](http://www.readwritethink.org/standards/index.html).