

ELECTRONICS TECHNOLOGY 1-4
ACTIVITY/COURSE CODES: 6133, 6134, 6135, 6136

PROGRAM DESCRIPTION: Within the NCCER Core-infused Electronics Technology program, students demonstrate knowledge of electrical and electronics theory in hands-on practical applications that incorporate a solid background of physical science, algebraic, and geometric reasoning skills. Upon completion of the Electronics Technology program, students will be career and college ready, with opportunities to gain industry-recognized credentials.

OBJECTIVE: Given the necessary equipment, supplies, and facilities, the student will complete all of the following core standards successfully.

CREDIT: 1 (120 hours), 2 (240 hours) per course code

RECOMMENDED PREREQUISITE: Algebra 1

RECOMMENDED GRADE LEVEL: 10-12

COMPUTER ACCESS REQUIRED: 1 Computer per student with Internet access

RECOMMENDED MAXIMUM ENROLLMENT: 20-24

RESOURCES: [Instructional Materials](#)

A. STUDENT ORGANIZATIONS

Proficient professionals know the academic subject matter, including professional development, required for proficiency within their area. They will use this knowledge as needed in their role. The following accountability criteria are considered essential for students in any program of study.

1. Identify the purpose and goals of a Career and Technology Student Organization (CTSO).
2. Explain how CTSOs are integral parts of specific clusters, majors, and/or courses.
3. Explain the benefits and responsibilities of being a member of a CTSO.
4. List leadership opportunities that are available to students through participation in CTSO conferences, competitions, community service, philanthropy, and other activities.
5. Explain how participation in CTSOs can promote lifelong benefits in other professional and civic organizations.

B. TECHNOLOGY KNOWLEDGE

Proficient professionals know the academic subject matter, including the ethical use of technology as needed in their role. The following accountability criteria are

considered essential for students in any program of study.

1. Demonstrate proficiency and skills associated with the use of technologies that are common to a specific occupation.
2. Identify proper netiquette when using e-mail, social media, and other technologies for communication purposes.
3. Identify potential abuse and unethical uses of laptops, tablets, computers, and/or networks.
4. Explain the consequences of social, illegal, and unethical uses of technology (e.g., piracy; cyberbullying, illegal downloading; licensing infringement; inappropriate uses of software, hardware, and mobile devices in the work environment).
5. Discuss legal issues and the terms of use related to copyright laws, fair use laws, and ethics pertaining to downloading of images, photographs, documents, video, sounds, music, trademarks, Creative Commons, and other elements for personal use.
6. Describe ethical and legal practices of safeguarding the confidentiality of business-related information.
7. Describe possible threats to a laptop, tablet, computer, and/or network and methods of avoiding attacks.

C. PERSONAL QUALITIES AND EMPLOYABILITY SKILLS

Proficient professionals know the academic subject matter, including positive work practices and interpersonal skills, as needed in their role. The following accountability criteria are considered essential for students in any program of study.

1. Demonstrate punctuality.
2. Demonstrate self-representation.
3. Demonstrate work ethic.
4. Demonstrate respect.
5. Demonstrate time management.
6. Demonstrate integrity.
7. Demonstrate leadership.
8. Demonstrate teamwork and collaboration.
9. Demonstrate conflict resolution.
10. Demonstrate perseverance.
11. Demonstrate commitment.
12. Demonstrate a healthy view of competition.
13. Demonstrate a global perspective.
14. Demonstrate health and fitness.
15. Demonstrate self-direction.
16. Demonstrate lifelong learning.

D. PROFESSIONAL KNOWLEDGE

Proficient professionals know the academic subject matter, including positive work practices and interpersonal skills, as needed in their role. The following

accountability criteria are considered essential for students in any program of study.

1. Demonstrate effective speaking and listening skills.
2. Demonstrate effective reading and writing skills.
3. Demonstrate mathematical reasoning.
4. Demonstrate job-specific mathematics skills.
5. Demonstrate critical-thinking and problem-solving skills.
6. Demonstrate creativity and resourcefulness.
7. Demonstrate an understanding of business ethics.
8. Demonstrate confidentiality.
9. Demonstrate an understanding of workplace structures, organizations, systems, and climates.
10. Demonstrate diversity awareness.
11. Demonstrate job acquisition and advancement skills.
12. Demonstrate task management skills.
13. Demonstrate customer-service skills.

E. SOLDERING AND ASSEMBLING TECHNIQUES

Proficient Manufacturing professionals demonstrate appropriate soldering and assembling techniques as needed in their role. The following accountability criteria are considered essential for students in the Electronics Technology program of study.

1. Select and maintain soldering and desoldering tools.
2. Solder and desolder components.
3. Select and install connection devices (e.g., terminal, lug, crimp, spade).

NCCER® CORE MODULES (EMBEDDED THROUGHOUT THE PROGRAM)

F. SAFETY

Proficient Manufacturing professionals demonstrate basic safety knowledge as needed in their role. The following accountability criteria are considered essential for students in the Electronics Technology program of study.

1. Identify the responsibilities and personal characteristics of a professional craftsman.
2. Describe the safe work requirements for elevated work.
3. Identify and explain how to avoid struck-by and caught-in-between hazards.
4. Explain the appropriate safety precautions around common job-site hazards.
5. Demonstrate the use and care of appropriate personal protective equipment (PPE).
6. Identify and describe other specific job-site safety hazards.
7. Follow safe procedures for lifting heavy objects.
8. Describe safe behavior on and around ladders and scaffolds.
9. Explain the importance of the Hazard Communication Standard (HazCom)

- requirement and Safety Data Sheets (SDS)
10. Describe fire prevention and firefighting techniques.
 11. Define safe work procedures around electrical hazards.
 12. Complete 10-hour OSHA course/assessment and receive card. (Optional)
 13. Complete Performance Tasks

G. CONSTRUCTION MATH

Proficient Manufacturing professionals demonstrate basic math skills as needed in their role. The following accountability criteria are considered essential for students in the Electronics Technology program of study.

1. Add, subtract, multiply, and divide whole numbers, with and without a calculator.
2. Use a standard ruler and a metric ruler to measure.
3. Add, subtract, multiply, and divide fractions.
4. Add, subtract, multiply, and divide decimals, with and without a calculator.
5. Convert decimals to percent and percent to decimals.
6. Convert fractions to decimals and decimals to fractions.
7. Explain what the metric system is and how it is important in the construction trade.
8. Recognize and use metric units of length, weight, volume, and temperature.
9. Recognize some of the basic shapes used in the construction industry and apply basic geometry to measure them.

H. INTRODUCTION TO HAND TOOLS

Proficient Manufacturing professionals demonstrate how to safely use various hand tools as needed in their role. The following accountability criteria are considered essential for students in the Electronics Technology program of study.

1. Recognize and identify various types of basic hand tools used in the construction trade.
2. Identify and describe how to use various types of measurement and layout tools.
3. Identify and explain how to use various types of cutting and shaping tools.
4. Use these tools safely.
5. Describe the basic procedures for taking care of these tools.
6. Complete Performance Tasks

I. INTRODUCTION TO POWER TOOLS

Proficient Manufacturing professionals demonstrate how to safely use power tools as needed in their role. The following accountability criteria are considered essential for students in the Electronics Technology program of study.

1. Identify and explain how to use various types of power drills and impact wrenches used in the construction trade.
2. Identify and explain how to use various types of power saws.
3. Identify and explain how to use various grinders and grinder attachments.

4. Identify and explain how to use miscellaneous power tools.
5. Use power tools safely.
6. Explain how to maintain power tools properly.
7. Complete Performance Tasks.

J. INTRODUCTION TO CONSTRUCTION DRAWINGS/RECOMMEND BLUEPRINT READING

Proficient Manufacturing professionals demonstrate knowledge and the use of blueprints/construction drawings as needed in their role. The following accountability criteria are considered essential for students in the Electronics Technology program of study.

1. Identify and describe various types of construction drawings, including their fundamental components and features.
2. Recognize and identify basic blueprint terms, components, and symbols.
3. Relate information on blueprints to actual locations on the print.
4. Recognize different classifications of drawings.
5. Interpret and use drawing dimensions.
6. Complete Performance Tasks

K. BASIC RIGGING (OPTIONAL)

Proficient Manufacturing professionals demonstrate how to use basic rigging as needed in their role. The following accountability criteria are considered essential for students in the Electronics Technology program of study.

1. Explain how ropes, chains, hoists, loaders, and cranes are used to move material and equipment from one location to another on a job site.
2. Describe inspection techniques and load-handling safety practices.
3. Explain the American National Standards Institute (ANSI) hand signals.
4. Complete Performance Tasks

L. BASIC COMMUNICATION SKILLS (SDE Requirement)

Proficient Manufacturing professionals demonstrate appropriate communication skills as needed in their role. The following accountability criteria are considered essential for students in the Electronics Technology program of study.

1. Describe the communication, listening and speaking processes and their relationship to job performance.
2. Describe good reading and writing skills and their relationship to job performance
3. Demonstrate telephone and e-communication skills necessary in the workplace.
4. Complete Performance Tasks.

M. BASIC EMPLOYABILITY SKILLS (SDE Requirement)

Proficient Manufacturing professionals demonstrate appropriate workplace behavior as needed in their role. The following accountability criteria are considered essential for students in the Electronics Technology program of study.

1. Describe the opportunities in the construction business and how an individual enters the construction workforce.
2. Explain the importance of critical thinking and how to solve problems in the workplace.
3. Explain the importance of social skills and identify ways good social skills are applied in the construction trade.
4. Describe computer systems and their industry applications.
5. Explain interpersonal relationship skills, self-presentation, and key workplace issues such as sexual harassment, stress, and substance abuse.

N. MATERIALS HANDLING

Proficient Manufacturing professionals demonstrate appropriate skills handling materials as needed in their role. The following accountability criteria are considered essential for students in the Electronics Technology program of study.

1. Describe the hazards associated with handling materials and provides techniques to avoid both injury and property damage.

LEVEL 1

O. DIRECT CURRENT (DC) ELECTRONICS

Proficient Manufacturing professionals demonstrate appropriate skills and knowledge in Direct Current Electronics as needed in their role. The following accountability criteria are considered essential for students in the Electronics Technology program of study.

1. Define voltage and identify the ways in which it can be produced.
2. Identify materials as either conductors, semiconductors, or insulators.
3. Identify electronic components and their schematic symbols utilizing existing codes and notations (e.g., color codes and exponential notation).
4. Interpret schematic, block, and pictorial diagrams.
5. Apply Ohm's law in solving DC electronic problems.
6. Apply Watt's law in solving DC electronic power problems.
7. Apply Kirchhoff's laws in solving DC electronic problems.
8. Evaluate and test DC series circuits.
9. Evaluate and test DC parallel circuits.
10. Evaluate and test DC series-parallel circuits.
11. Evaluate and test sources of DC signals and power.
12. Evaluate and test DC resistive devices.

13. Evaluate and test circuit controls (e.g., switches, fuses, circuit breakers, relays).
14. Demonstrate proper use of test equipment.

LEVEL 2

P. ALTERNATING CURRENT (AC) ELECTRONICS

Proficient Manufacturing professionals demonstrate appropriate skills and knowledge in Alternating Current Electronics as needed in their role. The following accountability criteria are considered essential for students in the Electronics Technology program of study.

1. Calculate the peak, effective, and RMS voltage or current values for an AC waveform.
2. Identify electronic components and their schematic symbols.
3. Interpret schematic, block, and pictorial diagrams.
4. Solve AC electronics problems involving current, voltage, resistance, reactance, impedance, and power.
5. Describe the function and operation of capacitors in AC circuits.
6. Describe the function and operation of inductors in AC circuits.
7. Describe the function and operation of RC, RL, and RLC circuits.
8. Calculate the phase relationship between two AC waveforms.
9. Describe the function and operation of transformers.
10. Demonstrate proper use of test equipment.

LEVEL 3

Q. SEMICONDUCTOR DEVICES

Proficient Manufacturing professionals demonstrate appropriate skills and knowledge of the functions and operations of semiconductor devices as needed in their role. The following accountability criteria are considered essential for students in the Electronics Technology program of study.

1. Identify electronic components and their schematic symbols.
2. Interpret schematic, block, and pictorial diagrams.
3. Describe the function and operation of semiconductor devices.
4. Describe the functions and operations of diode circuits, rectifiers, and transistor amplifiers.
5. Demonstrate techniques for handling and replacing semiconductors.
6. Describe the function and operation of operational amplifiers.
7. Construct circuits using semiconductor devices.
8. Describe and connect rectifiers, LEDs, SCRs, and solid-state relays.
9. Demonstrate proper use of test equipment.

LEVEL 4 (BASED ON LOCAL NEEDS ASSESSMENT: CHOOSE 1)

R. DIGITAL ELECTRONICS (OPTIONAL)

Proficient Manufacturing professionals demonstrate appropriate skills and knowledge of the functions and operations digital electronics as needed in their role. The following accountability criteria are considered essential for students in the Electronics Technology program of study.

1. Identify and convert number systems: binary, octal, decimal, hexadecimal, and binary coded decimal.
2. Identify electronic components and their schematic symbols.
3. Interpret schematic, block, and pictorial diagrams.
4. Interpret and develop truth tables and Boolean expressions of logic circuits.
5. Test the operation of logic gates.
6. Test the operation of clock and timing circuits.
7. Build and test combinational logic circuits for a given application.
8. Test counter and controller circuits for sequential logic applications.
9. Interpret information on integrated circuits (IC) data and specification sheets.
10. Test the operation of analog to digital (A/D) and digital to analog (D/A) converters.
11. Demonstrate proper use of test equipment.

S. HOME SMART SYSTEMS (OPTIONAL)

Proficient Manufacturing professionals demonstrate appropriate skills and knowledge for designing, installing, and troubleshooting home smart systems as needed in their role. The following accountability criteria are considered essential for students in the Electronics Technology program of study.

1. **SECURITY AND SURVEILLANCE**
 - a. Analyze the role and purpose of security and surveillance systems.
 - b. Identify devices used for security and surveillance systems.
 - c. Describe a UPS used for power outages.
 - d. Describe the uses of video surveillance and monitoring systems.
 - e. Identify the components and uses of a Wi-fi network.
 - f. Describe the control and communications of security and surveillance systems.
 - g. Design, install, and troubleshoot a security and surveillance system.
2. **AUDIO/VIDEO**
 - a. Analyze the role and purpose of audio and video systems.
 - b. Identify and describe the components of an audio and video system.
 - c. Identify, assemble, and install cabling and connectors for an audio and video system.
 - d. Describe the characteristics of analog and digital video signals.
 - e. Design, install, and troubleshoot an entertainment system.

3. HOME CONTROL SYSTEMS

- a. Analyze the role and purpose of home control systems.
- b. Identify and install devices used for environmental controls.
- c. Identify and install access controls.
- d. Identify and install lighting controls.
- e. Design, install, and troubleshoot a home control system.

4. TELECOMMUNICATIONS

- a. Analyze the role and purpose of phone and VoIP systems.
- b. Identify and install devices used for phone and VoIP systems.
- c. Design, install, and troubleshoot a telecommunications system.

T. INDUSTRIAL CONTROL SYSTEMS (OPTIONAL)

Proficient Manufacturing professionals demonstrate appropriate skills and knowledge of the functions and operations of industrial control systems as needed in their role. The following accountability criteria are considered essential for students in the Electronics Technology program of study.

1. Identify electronic component schematic symbols.
2. Test and repair motor control systems (e.g., starters, control wiring, variable- speed drives, overcurrent protection).
3. Identify and test sensors.
4. Test and repair solid-state power controls.
5. Test, repair, and maintain computer-controlled systems (e.g., CNC, robotics, and process control).

U. ADVANCED ELECTRONICS TECHNOLOGY (OPTIONAL)

Proficient Manufacturing professionals demonstrate appropriate skills and knowledge of advanced electronics theory as needed in their role. The following accountability criteria are considered essential for students in the Electronics Technology program of study.

1. Apply network theorems (superposition, Thevenin's, and Norton's).
2. Perform vector analysis in RL, RC, and RLC circuits.
3. Demonstrate uses of thyristors, analog ICs, and optoelectric devices.
4. Perform arithmetic operations in various digital number systems.
5. Test the operations of binary adders.
6. Apply De Morgan's theorem to simplify Boolean expressions.

V. PROGRAMMABLE LOGIC CONTROLS (OPTIONAL)

Proficient Manufacturing professionals demonstrate appropriate skills and knowledge of the functions and operations of programmable logic controls as needed in their role. The following accountability criteria are considered essential for students in the Electronics Technology program of study.

1. Identify electronic component schematic symbols.
2. Describe the function and purpose of a programmable logic controller (PLC).
3. Compare hardwired and PLC systems.
4. Convert between number systems.
5. Analyze a binary logic network.
6. Describe the purpose of the various power supplies used within a PLC.
7. Construct input/output (I/O) circuits.
8. Define the function of the PLC processor module.
9. Describe the interrelations between microprocessor components.
10. State the characteristics of the different types of memory.
11. Demonstrate the features of relay ladder logic instruction categories.
12. Demonstrate the principles used to correlate PLC hardware components to software instructions.
13. Convert a hardware ladder diagram to a PLC ladder diagram.
14. Program PLC using above diagram.
15. Troubleshoot problems in PLC circuit using a given diagram.

[Course Materials and Resources](#)

[Academic Standards and Indicators](#)