

AC/DC Electronics

Knowledge and skills. [ACDCELEC](#)

1 The student demonstrates the skills necessary for success in a technical career.

The student is expected to: [ACDCELEC.1](#)

- A** identify training, education, employment, and career opportunities, including differences between an electronic technician, electronic technologist, and electrical engineer; [ACDCELEC.1A](#)
- B** investigate and work toward industry certifications; [ACDCELEC.1B](#)
- C** discuss ethical issues related to electronics; [ACDCELEC.1C](#)
- D** identify and demonstrate respect for diversity in the workplace; [ACDCELEC.1D](#)
- E** identify and demonstrate appropriate actions and consequences relating to discrimination, harassment, and inequality; [ACDCELEC.1E](#)
- F** explore career preparation learning experiences, including job shadowing, mentoring, and apprenticeship training; and [ACDCELEC.1F](#)
- G** discuss Accreditation Board for Engineering and Technology (ABET) accreditation and implications. [ACDCELEC.1G](#)

2 The student participates in team projects in various roles. The student is expected to: [ACDCELEC.2](#)

- A** explain the importance of teamwork in the field of electronics; [ACDCELEC.2A](#)
- B** apply principles of effective teamwork and problem solving, including collaboration and conflict resolution; and [ACDCELEC.2B](#)
- C** demonstrate proper attitudes as a team leader and team member. [ACDCELEC.2C](#)

3 The student develops skills for managing a project. The student is expected to: [ACDCELEC.3](#)

- A** implement project management methodologies, including initiating, planning, executing, monitoring and controlling, and closing a project; [ACDCELEC.3A](#)
- B** develop a project schedule and complete work according to established criteria; [ACDCELEC.3B](#)
- C** participate in the organization and operation of a real or simulated engineering project; and [ACDCELEC.3C](#)
- D** develop a plan for production of an individual product. [ACDCELEC.3D](#)

4 The student practices safe and proper work habits. The student is expected to: [ACDCELEC.4](#)

- A** master relevant safety tests; [ACDCELEC.4A](#)

- B comply with safety guidelines as described in various manuals, instructions, and regulations; ACDCELEC.4B
- C identify governmental and organizational regulations for health and safety in the workplace related to electronics; ACDCELEC.4C
- D identify and classify hazardous materials according to Occupational Safety and Health Administration (OSHA) regulations and industry standards; ACDCELEC.4D
- E dispose of hazardous materials appropriately; ACDCELEC.4E
- F perform maintenance on selected tools, equipment, and machines; ACDCELEC.4F
- G handle and store tools and materials correctly; and ACDCELEC.4G
- H describe the results of improper maintenance of material, tools, and equipment. ACDCELEC.4H

5 The student develops an understanding of basic direct current (DC) electricity principles. The student is expected to: ACDCELEC.5

- A describe DC and give examples of its application and generation; ACDCELEC.5A
- B demonstrate an understanding of atomic theory and the relationship between atomic number and a material's conductivity and insulation characteristics; ACDCELEC.5B
- C identify and apply the proper use of electronic schematics and symbols, including switches, voltage, current, ground, resistors, fuses, circuit breakers, volt meters, and amp meters; ACDCELEC.5C
- D define and describe switches, voltage source, current source, ground, resistors, fuses, circuit breakers, volt meters, amp meters, voltage, current, and resistance; ACDCELEC.5D
- E identify the resistance value from the resistor color code; ACDCELEC.5E
- F express Ohm's Law in three forms with appropriate symbols and units; ACDCELEC.5F
- G express the Power Law in three forms with appropriate symbols and units; ACDCELEC.5G
- H describe series, parallel, and combination circuits; ACDCELEC.5H
- I apply Ohm's Law to calculate current, voltage drops, and resistance for each component in a multi-component series, parallel, and combination circuit; ACDCELEC.5I
- J apply the Power Law to calculate current, voltage drops, resistance, and power for each component in a multi-component series, parallel, and combination circuit; and ACDCELEC.5J
- K express current and resistance values in both scientific notation and engineering notation. ACDCELEC.5K

6 The student develops an understanding of basic alternating current (AC) electricity principles. The student is expected to: ACDCELEC.6

- A describe AC and give examples of its application and generation; ACDCELEC . 6A
 - B calculate peak, peak-to-peak, average, and root mean square (RMS) voltage; ACDCELEC . 6B
 - C explain the relationship between mechanical load and current in a generator; ACDCELEC . 6C
 - D identify the purpose and application of a transformer; ACDCELEC . 6D
 - E identify voltage and current values relative to a turns ratio in a transformer; ACDCELEC . 6E
 - F describe and calculate capacitance and capacitive reactance; and ACDCELEC . 6F
 - G describe and calculate inductance and inductive reactance. ACDCELEC . 6G
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7 The student implements the concepts and skills that form the technical knowledge of electronics using project-based assessments. The student is expected to: ACDCELEC . 7

- A apply Ohm's law, Kirchhoff's laws, and power laws to actual or simulated circuits; ACDCELEC . 7A
 - B build series, parallel, and combination circuits; ACDCELEC . 7B
 - C demonstrate an understanding of magnetism and induction as they relate to electronic circuits; ACDCELEC . 7C
 - D perform electrical-electronic troubleshooting assignments; ACDCELEC . 7D
 - E identify actual electronic components, including resistors, capacitors, switches, fuses, power sources, and inductors; ACDCELEC . 7E
 - F explain how torque is produced in a motor; and ACDCELEC . 7F
 - G explain where counter electromotive force (CEMF) comes from in a motor. ACDCELEC . 7G
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8 The student applies the concepts and skills to simulated and actual work situations. The student is expected to: ACDCELEC . 8

- A measure and calculate resistance, current, voltage, and power in series, parallel, and complex circuits; ACDCELEC . 8A
 - B apply electrical theory to generators, electric motors, and transformers; and ACDCELEC . 8B
 - C design analog circuits using common components. ACDCELEC . 8C
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9 The student learns the function and application of the tools, equipment, and materials used in electronics through project-based assignments. The student is expected to: ACDCELEC . 9

- A use tools and laboratory equipment in a safe manner to construct and repair circuits; ACDCELEC . 9A
- B use precision measuring instruments to analyze circuits and prototypes; ACDCELEC . 9B

- C demonstrate an understanding of the difference between current and voltage measurement; ACDCELEC.9C
 - D use a multimeter to perform resistance, voltage, and current measurements; ACDCELEC.9D
 - E describe and perform measurements, including period and amplitude, using an oscilloscope; ACDCELEC.9E
 - F use multiple software applications to simulate circuit behavior and present concepts; and ACDCELEC.9F
 - G use a project notebook to record measured values, lab observations and results, circuit operational requirements, and circuit design and modifications. ACDCELEC.9G
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10 The student designs a circuit using appropriate design processes and techniques. The student is expected to: ACDCELEC.10

- A interpret industry standard circuit schematics; ACDCELEC.10A
 - B identify areas where quality, reliability, and safety can be designed into a circuit; ACDCELEC.10B
 - C improve a circuit design to meet a specified need; ACDCELEC.10C
 - D sketch schematics; and ACDCELEC.10D
 - E explore new technologies that may affect electronics. ACDCELEC.10E
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11 The student builds a prototype circuit using the appropriate tools, materials, and techniques. The student is expected to: ACDCELEC.11

- A identify and describe the steps needed to produce a prototype; ACDCELEC.11A
- B identify and use appropriate tools, equipment, machines, and materials to produce the prototype; and ACDCELEC.11B
- C present a final project using a variety of media. ACDCELEC.11C