# Scope & Sequence

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| **Course Name:** AC/DC Electronics**TSDS PEIMS Code:** 13036800 | **Course Credit:** 1.0**Course Requirements:** Recommended for students in Grades 10-12.**Prerequisites:** None.**Recommended Prerequisite:** Principles of Applied Engineering. |
| **Course Description:** AC/DC Electronics focuses on the basic electricity principles of alternating current/direct current (AC/DC) circuits. Students will demonstrate knowledge and applications of circuits, electronic measurement, and electronic implementation. Through use of the design process, students will transfer academic skills to component designs in a project-based environment. Students will use a variety of computer hardware and software applications to complete assignments and projects. Additionally, students will explore career opportunities, employer expectations, and educational needs in the electronics industry. |
| **NOTE:** This is a suggested scope and sequence for the course content. This content will work with any textbook or instructional materials. If locally adapted, make sure all TEKS are covered. |
| **Total Number of Periods****Total Number of Minutes****Total Number of Hours** | 175 Periods7,875 Minutes131.25 Hours | \*Schedule calculations based on 175/180 calendar days. For 0.5 credit courses, schedule is calculated out of 88/90 days. Scope and sequence allows additional time for guest speakers, student presentations, field trips, remediation, extended learning activities, etc. |
| **Unit Number, Title, and Brief Description** | **# of Class Periods\***(assumes 45-minute periods)Total minutes per unit | **TEKS Covered****130.405. (c) Knowledge and skills** |
| **Unit 1: Science, Technology, Engineering, and Mathematics (STEM) AC/DC Electronics Overview**This Science, Technology, Engineering, and Mathematics (STEM) AC/DC Electronic Overview unit is designed to give students the opportunity to explore training, education, employment roles and career opportunities. Students will investigate and work create a plan to work towards industry certifications. Upon culmination of the unit, students will submit findings about career preparation, including job shadowing, mentoring, and apprenticeship training.  | 15 Periods675 Minutes | (2) The student demonstrates the skills necessary for success in a technical career. The student is expected to:(A) identify training, education, employment, and career opportunities, including differences between an electronic technician, electronic technologist, and electrical engineer;(B) investigate and work toward industry certifications;(C) discuss ethical issues related to electronics;(D) identify and demonstrate respect for diversity in the workplace;(E) identify and demonstrate appropriate actions and consequences relating to discrimination, harassment, and inequality;(F) explore career preparation learning experiences, including job shadowing, mentoring, and apprenticeship training; and(G) discuss Accreditation Board for Engineering and Technology (ABET) accreditation and implications. |
| **Unit 2: Safety Precautions**This unit offers students the opportunity to demonstrate basic technical skills necessary for safety precautions in the STEM field. Students will adhere to and follow all guidelines and regulations to maintain a safe working environment. The culminating activity will have students describe the results of negligent or improper maintenance of tools, equipment, and machines. | 10 Periods450 Minutes | (5) The student practices safe and proper work habits. The student is expected to:(A) master relevant safety tests;(B) comply with safety guidelines as described in various manuals, instructions, and regulations;(C) identify governmental and organizational regulations for health and safety in the workplace related to electronics;(D) identify and classify hazardous materials according to Occupational Safety and Health Administration (OSHA) regulations and industry standards;(E) dispose of hazardous materials appropriately;(F) perform maintenance on selected tools, equipment, and machines;(G) handle and store tools and materials correctly; and(H) describe the results of improper maintenance of material, tools, and equipment. |
| **Unit 3: Electricity Principles**The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services. *In this unit, students will complete activities such as* describe DC and demonstrate an understanding of atomic theory and a material's conductivity and insulation characteristics. The culminating activity will include applying Ohm's Law to calculate current, voltage drops, and resistance for each component in a multi-component series, parallel, and combination circuit, as well as express current and resistance values in both scientific notation and engineering notation. | 15 Periods675 Minutes | (6) The student develops an understanding of basic direct current (DC) electricity principles. The student is expected to:(A) describe DC and give examples of its application and generation;(B) demonstrate an understanding of atomic theory and the relationship between atomic number and a material's conductivity and insulation characteristics;(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;(D) define and describe switches, voltage source, current source, ground, resistors, fuses, circuit breakers, volt meters, amp meters, voltage, current, and resistance;(E) identify the resistance value from the resistor color code;(F) express Ohm's Law in three forms with appropriate symbols and units;(G) express the Power Law in three forms with appropriate symbols and units;(H) describe series, parallel, and combination circuits;(I) apply Ohm's Law to calculate current, voltage drops, and resistance for each component in a multi-component series, parallel, and combination circuit;(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(K) express current and resistance values in both scientific notation and engineering notation. |
| **Unit 4: Basic Alternating Current (AC) Electricity Principles**In this unit, students will perform such activities as describing AC and give examples of its application and generation and explaining the relationship between mechanical load and current in a generator. The culminating activity will have students identify the purpose and application of a transformer and describe inductance and inductive reactance. | 15 Periods675 Minutes | (7) The student develops an understanding of basic alternating current (AC) electricity principles. The student is expected to:(A) describe AC and give examples of its application and generation;(B) calculate peak, peak-to-peak, average, and root mean square (RMS) voltage;(C) explain the relationship between mechanical load and current in a generator;(D) identify the purpose and application of a transformer;(E) identify voltage and current values relative to a turns ratio in a transformer;(F) describe and calculate capacitance and capacitive reactance; and(G) describe and calculate inductance and inductive reactance. |
| **Unit 5: Time for Project Based Learning**In this unit, students will apply Ohm's law and build series, parallel, and combination circuits. The project based assessment will have students explain how torque is produced in a motor and how electromotive force (CEMF) comes from in a motor. | 15 Periods675 Minutes | (8) The student implements the concepts and skills that form the technical knowledge of electronics using project-based assessments. The student is expected to:(A) apply Ohm's law, Kirchhoff's laws, and power laws to actual or simulated circuits;(B) build series, parallel, and combination circuits;(C) demonstrate an understanding of magnetism and induction as they relate to electronic circuits;(D) perform electrical-electronic troubleshooting assignments;(E) identify actual electronic components, including resistors, capacitors, switches, fuses, power sources, and inductors;(F) explain how torque is produced in a motor; and(G) explain where counter electromotive force (CEMF) comes from in a motor. |
| **Unit 6: Real-World Applications**In this unit, students will apply the concepts and skills from the previous units to simulated and actual work situations. The culminating activity will include having students design analog circuits using common components. | 15 Periods675 Minutes | (9) The student applies the concepts and skills to simulated and actual work situations. The student is expected to:(A) measure and calculate resistance, current, voltage, and power in series, parallel, and complex circuits;(B) apply electrical theory to generators, electric motors, and transformers; and(C) design analog circuits using common components. |
| **Unit 7: Electronic Tools, Equipment, and Materials** Students will perform experiments in a laboratory to construct and repair circuits. The culminating activity will have students use multiple software applications to simulate circuit behavior and present concepts. | 15 Periods675 Minutes | (10) 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:(A) use tools and laboratory equipment in a safe manner to construct and repair circuits;(B) use precision measuring instruments to analyze circuits and prototypes;(C) demonstrate an understanding of the difference between current and voltage measurement;(D) use a multimeter to perform resistance, voltage, and current measurements;(E) describe and perform measurements, including period and amplitude, using an oscilloscope;(F) use multiple software applications to simulate circuit behavior and present concepts; and(G) use a project notebook to record measured values, lab observations and results, circuit operational requirements, and circuit design and modifications. |
| **Unit 8: Designing a Circuit**In this unit, students will perform such functions such as interpreting industry standard circuit schematics and improving a circuit design to meet a specified need. The culminating activity will have students sketch schematics and explore new technologies that may affect electronics. | 15 Periods675 Minutes | (11) The student designs a circuit using appropriate design processes and techniques. The student is expected to: (A) interpret industry standard circuit schematics;(B) identify areas where quality, reliability, and safety can be designed into a circuit;(C) improve a circuit design to meet a specified need;(D) sketch schematics; and(E) explore new technologies that may affect electronics. |
| **Unit 9: Teamwork in STEM**In this unit students will demonstrate teamwork processes that promote team building, consensus, continuous improvement, respect for the opinions of others, cooperation, adaptability, and conflict resolution. Students will collaborate to work together efficiently, using positive interpersonal skills to establish and maintain effective working relationships in order to demonstrate how teams function well. | 15 Periods675 Minutes | (3) The student participates in team projects in various roles. The student is expected to:(A) explain the importance of teamwork in the field of electronics;(B) apply principles of effective teamwork and problem solving, including collaboration and conflict resolution; and(C) demonstrate proper attitudes as a team leader and team member. |
| **Unit 10: Project Management**In this unit, students will develop a project management plan including initiating, executing, monitoring, controlling, and closing a real or simulated project. The culminating activity will have students develop and present a production plan for an individual project. | 15 Periods675 Minutes | (4) The student develops skills for managing a project. The student is expected to:(A) implement project management methodologies, including initiating, planning, executing, monitoring and controlling, and closing a project;(B) develop a project schedule and complete work according to established criteria;(C) participate in the organization and operation of a real or simulated engineering project; and(D) develop a plan for production of an individual product. |
| **Unit 11: Employability Skills**This unit offers students basic technical skills necessary to fulfill careers in the workforce. Through group activities, students will demonstrate interpersonal skills, such as: communication, professionalism, decision-making, leadership, and conflict resolution. The unit culminates with a peer review evaluation and reflection upon skills needed for success in the workforce. | 15 Periods675 Minutes11.25 Hours | (1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:(A) demonstrate knowledge of how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession;(B) show the ability to cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome;(C) present written and oral communication in a clear, concise, and effective manner, including explaining and justifying actions;(D) demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results; and(E) demonstrate punctuality, dependability, reliability, and responsibility in performing assigned tasks as directed. |
| **Unit 12: Extended Learning Experience**This unit will have students build a prototype circuit. In this unit, students are encouraged to expand their learning experiences through avenues such as STEM organizations and other leadership or extracurricular organizations. By connecting with these networks and/or their peers in the previous unit, students will present their final project which may lead to future career opportunities.  | 15 Periods675 Minutes11.25 Hours | (12) The student builds a prototype circuit using the appropriate tools, materials, and techniques. The student is expected to:(A) identify and describe the steps needed to produce a prototype;(B) identify and use appropriate tools, equipment, machines, and materials to produce the prototype; and(C) present a final project using a variety of media. |