

Electronics DC/AC

Level 3: Student may have explored previously; first pathway specific course
Pathway(s): Engineering & Technology; Mechatronics

Description

This course introduces the basic principles of electronics including the fundamentals of Direct Current (DC), Alternating Current (AC), and robotics. Topics include basic circuits, voltage, current and resistance measurement, Ohm's Law, series and parallel circuits, magnetism, motors and generators, electromagnetic induction, and robotics. Electronic theory is reinforced through breadboarding circuits in the lab. Students fabricate printed circuit board projects. Utilization of electronic test equipment is emphasized.

NOTE: This course is still in draft form. While no additional competencies will be added, some may be removed.

Student Learning Outcomes

Introduction, Safety, and Electrical Concepts

- 1) Identify and practice safe work habits including the use of Personal Protective Equipment (PPE), as necessary
- 2) Describe first aid for electrical shock
- 3) Use precision measuring instruments to analyze circuits and prototypes
- 4) Demonstrate an understanding of the difference between current and voltage measurement
- 5) Use a multimeter to perform resistance, voltage, and current measurements
- 6) Describe the construction and application of potentiometers
- 7) Describe and perform measurements, including period and amplitude, using an oscilloscope
- 8) Use software applications to simulate circuit behavior and present concepts

Career Training and Opportunities

- 9) Identify training, education, employment, and career opportunities, including the differences between electronic technician, electronic technologist, and electrical engineer
- 10) Investigate and work towards industry certifications
- 11) Explore career preparation learning experiences, including work-based learning, mentoring, and apprenticeship training

Basic Direct Current (DC) Electricity Principles

- 12) Describe DC and give examples of its application and generation
- 13) Demonstrate an understanding of atomic theory and the relationship between atomic number and a material's conductivity and insulation characteristics
- 14) 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

- 15) Define and describe switches, voltage source, currents source, ground, resistors, fuses, circuit breakers, volt meters, amp meters, voltage, current, and resistance
- 16) Identify the resistance value from the resistor color code
- 17) Express Ohm's Law in three forms with appropriate symbols and units
- 18) Express the Power Law in three forms with appropriate symbols and units
- 19) Describe series, parallel and combination circuits
- 20) Apply Ohm's Law to calculate current, voltage drops, and resistance for each component in a multi-component series, parallel, and combination circuit
- 21) Apply the Power Law to calculate current, voltage drops, resistance, and power for each component in a multi-component series, parallel and combination circuit
- 22) Express current and resistance values in both scientific notation and engineering notation

Basic Alternating Current (AC) Electricity Principles

- 23) Describe AC and give examples of its application and generation
- 24) Calculate peak, peak-to-peak, average, and root mean square (RMS) voltage
- 25) Explain the relationship between mechanical load and current in a generator
- 26) Identify the purpose and application of a transformer
- 27) Identify voltage and current values relative to a turns ration in a transformer
- 28) Describe and calculate capacitance and capacitive reactance
- 29) Describe and calculate inductance and inductive reactance

Application of DC/AC

- 30) Apply Ohm's law, Kirchhoff's law, and power laws to actual or simulated circuits
- 31) Build series, parallel, and combination circuits
- 32) Demonstrate an understanding of magnetism and induction as they relate to electronic circuits
- 33) Troubleshoot series-parallel circuits for opens and shorts
- 34) Test/troubleshoot reactive devices
- 35) Identify actual electronic components, including resistors, capacitors, switches, fuses, power sources and inductors
- 36) Explain how torque is produced in a motor
- 37) Explain where counter electromotive force (CEMF) comes from in a motor
- 38) Measure and calculate resistance, current, voltage, and power in series, parallel, and complex circuits
- 39) Apply electrical theory to generators, electric motors, and transformers
- 40) Design analog circuits using common components
- 41) Interpret industry standard circuit schematics
- 42) Identify areas where quality, reliability, and safety can be designed into a circuit
- 43) Improve a circuit design to meet a specific need
- 44) Sketch schematics
- 45) Explore new technologies that may affect electronics

