

Course Title: Electronics
Board Approval Date: May 21, 2020
Credit / Hours: 1

Course Description:

Students will study a range of topics related to electricity including electric theory, residential wiring, electrical safety, electronic components, and circuit building. Significant time will be given to the practical application. In addition to traditional forms of assessment, students will be assessed on their ability to complete experiments and projects successfully. At least one of the projects will be drawn, sourced, and constructed by the student.

Learning Activities / Modes of Assessment:

Large Group Instruction Guided Practice Small Group Projects Audio/Visual Media Computer Simulations Laboratory Experiments	Homework Problems Laboratory Reports Tests and Quizzes Teacher Observation
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Instructional Resources:

- Electronics Lab Equipment
 - (power supplies, electronic components, digital multimeters, soldering equipment, oscilloscope)
- All New Electronics Self-Teaching Guide by Harry Kybett
- Microsoft Excel or similar software

Curriculum: Dover Area School District
 Course: Electronics
 Topic: Electrical History and Safety

Know:	Understand:	Do:
PA 3.2.12.B What is Electricity Timeline of Electrical Discoveries Electricity in the Human Body Vocabulary: Electric Fibrillation Milliamp	What is Electricity? When did important electric discoveries take place? What is the effect of electricity on the human body?	Define electricity Create a timeline of electric history Know the effect of electric current in the human body Investigate the effect of electrical current in a hot dog.

Curriculum: Dover Area School District
 Course: Physics
 Topic: Electric Theory

Know:	Understand:	Do:
PA 3.2.12.B Elementary Charge Coulomb's Law Voltage Batteries Current Vocabulary: Charge Voltage Current Resistor Coulomb Ampere Conductor Insulator	What is electrical charge? How do charges interact with each other? What are several charge separation methods/devices? What is electrical current?	Describe the nature of electric charge Solve problems involving Coulomb's Law Compare and contrast types of batteries Create a battery and measure its voltage Define electric current

Curriculum: Dover Area School District
 Course: Physics
 Topic: Ohm's Law

Know:	Understand:	Do:
PA 3.2.12.B Resistors Ohm's Law Electrical Power Circuit Analysis Vocabulary: Resistance Ohm Parallel Series Power Watt Schematic Drawing	What causes electrical resistance? How are voltage, current and resistance related? How can current in a circuit be determined from a schematic?	Describe electric resistance Solve Ohm's law problems Calculate power dissipated by a device in a circuit Solve circuits involving up to 5 resistors in series and parallel arrangements Construct and measure series and parallel

Curriculum: Dover Area School District

Course: Physics

Topic: Electrical Energy

Know:	Understand:	Do:
<p>PA 3.2.12.B</p> <p>Electrical Energy</p> <p>Solar Power</p> <p>Vocabulary:</p> <ul style="list-style-type: none">EnergyKilowatt-hourInsolationInvertorPhotovoltaic	<p>What is the cost of electrical energy?</p> <p>How can a device's electrical energy consumption be determined?</p> <p>How many solar panels are needed for a typical residential home?</p> <p>What is the payback period for a solar array installation?</p>	<p>Describe electric energy</p> <p>Calculate the electric energy used or generated</p> <p>Describe the factors involved in sizing a PV solar array</p> <p>Create an estimate for a PV solar array installation based on a customer's electric bill</p>

Curriculum: Dover Area School District

Course: Physics

Topic: Residential Electricity

Know:

Understand:

Do:

<p>PA 3.2.12.B</p> <p>Electricity Production and Distribution</p> <p>Residential Wiring</p> <p>Vocabulary:</p> <ul style="list-style-type: none">TransmissionDistributionRomexDuplex ReceptacleTransformer	<p>How does electrical energy transfer from the power plant to your home?</p> <p>What safety features exist in a residential electrical system?</p> <p>How are residential electrical systems installed?</p>	<p>Describe the steps moving electric energy from a power plant to a residence</p> <p>Install several typical residential wiring examples</p>
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Curriculum: Dover Area School District
 Course: Physics
 Topic: Electromagnetism

Know:	Understand:	Do:
PA 3.2.12.B Magnetic Theory Electromagnetic Theory Lorentz Force Faraday's Law Magnetic Applications Vocabulary: Pole Domain Magnet Magnetic Field Commutator Induction	What causes magnetism? How can a magnetic field be visualized? How can current induce a magnetic field? How can a magnetic field induce current? How do electric motors work? How do cathode ray tubes work?	Describe the cause of magnetism Draw magnetic field lines Describe the nature of the Lorentz Force Describe the nature of electromagnetic induction Create a DC motor Show how electromagnetism is used in several common devices

Curriculum: Dover Area School District
Course: Physics
Topic: Capacitors

Know:	Understand:	Do:
<p>PA 3.2.12.B</p> <p>Capacitance</p> <p>Capacitors in Circuits</p> <p>Transient State Equation</p> <p>Vocabulary:</p> <ul style="list-style-type: none">CapacitanceFaradTransient State	<p>What is a capacitor?</p> <p>How is energy stored in a capacitor?</p> <p>How can the current be calculated in a circuit containing a capacitor?</p>	<p>Describe how capacitors store energy</p> <p>Describe the behavior of a capacitor in a circuit</p> <p>Calculate the initial and final state of a circuit containing a capacitor</p> <p>Calculate the transient current in a circuit containing a capacitor</p> <p>Measure discharge time in an RC circuit.</p>

Curriculum: Dover Area School District
 Course: Physics
 Topic: Inductors and Filters

Know:	Understand:	Do:
PA 3.2.12.B Inductance Inductors in Circuits Passive Filters LC Oscillators Vocabulary: Inductance Henry Filter Oscillator Resonance Low Cut High Cut Low Pass High Pass	What is an inductor? How do inductors behave in circuits? How do you “tune” a radio circuit? How can a frequency range be removed from a signal?	Describe the behavior of an inductor in a circuit Calculate the initial and final state of a circuit containing a capacitor Calculate the transient current in a circuit containing a capacitor Design a passive filter to given criteria Calculate the resonant frequency of an LC oscillator

Curriculum: Dover Area School District
 Course: Physics
 Topic: Semiconductors

Know:	Understand:	Do:
PA 3.2.12.B Semiconductor Theory Diodes Transistors Transistor Switching Transistor Amplification Vocabulary: Semiconductor Doping Diode Transistor Bias Active Saturation Beta (H_{fe}) Amplifier DC Offset	What is a semiconductor? How are semiconductors produced? What are diodes and how do they work? How do transistors work? How can a transistor be used as a switch? How can a transistor be used as an amplifier?	Describe the process and purpose of semiconductor doping Solve a circuit that contains a diode Describe the operation of an NPN transistor Draw a circuit with a transistor operating as a switch Draw a circuit with a transistor operating as an amplifier

Curriculum: Dover Area School District

Course: Physics

Topic: **Circuit Building**

Know:

Understand:

Do:

PA 3.2.12.B Reading Schematics Ordering Components Breadboarding PCB Soldering Testing Vocabulary: Breadboard Prototyping PCB Solder	How can a circuit be constructed using a schematic diagram as a model? Where can electronic components be purchased from? How are electronic components soldered to a PCB? What common problems exist during circuit prototyping?	Build five circuits from schematics Find a schematic of a circuit that they would like to build Source the electronic components for their circuit Breadboard their circuit Solder their circuit to a PC board Create a report summarizing the results of their circuit building project
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Electronics: Pacing Guide

Course: Electronics

Course Unit (Topic Periods)	Length of Instruction (Class Periods)
1. Electrical History and Safety	5 days
2. Electric Theory	8 days
3. Ohm's Law	10 days
4. Electrical Energy	5 days
5. Residential Electricity	5 days
6. Electromagnetism	10 days
7. Capacitors	5 days
8. Inductors and Filters	5 days
9. Semiconductors	7 days
10. Circuit Building	30 days