



## Power Engineering 5-6 Syllabus

### Course Goals

#### 1 Energy and Electricity

Students learn about the different methods of generating energy, alternating and direct currents, voltage, and resistance.

#### 2 Electricity and the Power Grid

Students develop an understanding of how electricity is distributed throughout a community and the way energy usage impacts the residential and commercial sectors of that community.

#### 3 Conserving Energy

Students learn about ways to conserve energy in the home and at the community level.

### Course Topics

#### 1 Electricity

Students learn about currents, resistance, voltage, watts, circuit diagrams, and Ohm's law.

#### 2 Circuits

Students practice building circuits with various constraints using the snap circuit kits.

#### 3 Batteries

Students learn how batteries generate electricity and build their own battery with a potato and other household objects.

#### 4 Generating Electricity

Students learn about various methods of generating electricity, including nuclear power, coal, natural gas, hydroelectric systems, wind farms, and solar power.

#### 5 Computer Simulations

Students use computer simulations to develop an understanding of power usage at the home and community level.

#### 6 Wind Turbines

Students design and build a wind turbine that generates electricity.

#### 7 Solar Panels

Students build a car powered by solar panels and learn how the panels generate energy.

#### 8 Energy Conservation and Pollution

Students learn why it is important to conserve energy, how we can conserve energy in our homes and in the community, and ways to limit pollution.

#### 9 Community Power Grid

Students work together to design and create a model community and community power distribution system.

### Course Schedule

## Day 1

### Introduction, Ice Breakers, FCS Rules

Students get to know each other, the instructor, and Fairfax Collegiate expectations.

### Act Out a Circuit

Students use background knowledge and basic electricity concepts to act out a circuit.

### Basic Circuit Elements

Students understand the purpose of circuit diagrams and the basic parts of a circuit.

### Voltage, Current, Resistance Experiments

Students start to use Circuit Snap Kits to further their understanding of voltage, current, and resistance.

### Basics Checklist

Students use SnapCircuits kits to practice creating different basic circuits.

## Day 2

### Basics Checklist

Students use SnapCircuits kits to practice creating different basic circuits.

### Capacitors and Parallel/Series Circuits

Students develop an understanding of capacitors and parallel/series circuits.

### Potato Battery

Students create and experiment with a potato-powered battery.

## Day 3

### Parallel/Series Checklist

Students use SnapCircuit kits to create parallel and series circuits.

### Parallel/Series Review

Students review concepts related to parallel and series circuits.

### Ways We Generate Energy

Students learn about the different ways we generate and distribute electricity.

## Day 4

### Transistors and Relays

Students learn the basic concepts that allow on/off switches to function.

### On/Off Checklist

Students use SnapCircuit kits to put transistor and relay concepts to use.

### Computer Simulations

Students use computer simulations to answer questions about a community power grid, as well as power use in a home.

## Day 5

### Motors and Solar Panels

Students begin to learn motors and solar panels and how we can use them to conserve electricity.

## **Going Green Checklist**

Students use SnapCircuits to find ways conserve electricity.

## **Wind Turbine**

Students use PVC and poster board to design and build a working wind turbine.

## **Day 6**

### **Solar Power**

Students learn what solar power is and why it is a good alternative to fossil fuels.

### **Solar Car**

Students build and experiment with a small solar powered car.

## **Day 7**

### **Hydropower**

Students learn about hydropower and why it is an alternative to fossil fuel.

### **Hydropower Experiment**

Students create their own model water wheel that generates hydropower.

## **Day 8**

### **Thermal Energy**

Students experiment with the amount of thermal energy different substances provide.

### **Carbon Sequestration**

Students design and build a filter to model the carbon sequestration process.

## **Day 9**

### **Review/Catch Up**

Students can return to any unfinished projects and/or review what they have learned.

### **Engineering Design Process**

Students learn about the process engineers use to design and revise their projects.

### **Final Project - Circuit Town**

Students work as a class to design and build a model community with circuits that distribute electricity.

## **Day 10**

### **Final Project - Circuit Town**

Students work as a class to design and build a model community with circuits that distribute electricity.

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