

# Auxiliary Concept: Circuit Theory

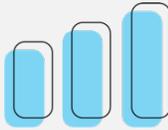
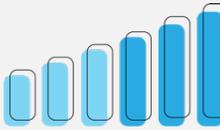
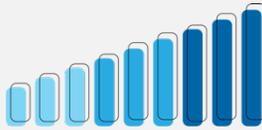
**Engineering Literacy Dimension:** Engineering Knowledge

**Domain:** Engineering Sciences

**Overview:** *Circuit Theory* is the collection of scientific knowledge used to describe the flow of electrical energy through an electrical circuit. This concept is important to Engineering Literacy as it enables an engineering professional to mathematically represent and verify how electrical components relate to one another in order to design and develop electrical circuits to perform specific tasks appropriately.

## Performance Goal for High School Learners

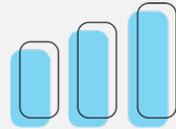
I can, when appropriate, draw upon the knowledge of Circuit Theory content, such as (a) *series and parallel circuits*, (b) *Ohm's Laws*, (c) *Kirchhoff's Laws*, (d) *resistance, capacitance and inductance*, (e) *wave forms*, (f) *signals*, and (g) *current, voltage, charge, energy, power, and work*, to design, and mathematically justify, an electrical circuit to solve problems in a manner that is analytical, predictive, repeatable, and practical.

	 Basic	 Proficient	 Advanced
<b>SERIES &amp; PARALLEL CIRCUITS</b>	I can identify structural differences between series and parallel circuits.	I can explain resistance, capacitance, and inductance relationships between series and parallel circuits.	I can determine and justify which configuration is more appropriate for my design.
<b>OHM'S LAWS</b>	I can describe the relationship between voltage, currents, and resistance, using Ohm's laws.	I can calculate voltage, current, and resistance in different types of circuits with Ohm's laws.	I can apply Ohm's laws to analyze imposed criteria and constraints and make a decision in designing an electrical circuit.
<b>KIRCHHOFF'S LAWS</b>	I can describe the relationship between voltage, currents, and resistance, using Kirchhoff's laws.	I can calculate voltage, current, and resistance in different types of circuits with Kirchhoff's laws. I understand the shortcut equations (nodal and loop) of Kirchhoff's Laws.	I can apply Kirchhoff's laws to analyze imposed criteria and constraints and make a decision in designing an electrical circuit.
<b>RESISTANCE, CAPACITANCE, &amp; INDUCTANCE</b>	I can distinguish between resistance, capacitance, and inductance and describe their relationship.	I can calculate impedance, capacitance, and inductance, using equations illustrating their mathematical relationships.	I can infer criteria and constraints related to the use of impedances, capacitances, and inductances to solve a design problem.

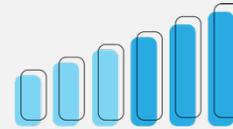
## Auxiliary Concept: Circuit Theory Cont.

### Performance Goal for High School Learners

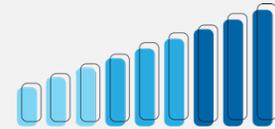
I can, when appropriate, draw upon the knowledge of Circuit Theory content, such as (a) *series and parallel circuits*, (b) *Ohm's Laws*, (c) *Kirchhoff's Laws*, (d) *resistance, capacitance and inductance*, (e) *wave forms*, (f) *signals*, and (g) *current, voltage, charge, energy, power, and work*, to design, and mathematically justify, an electrical circuit to solve problems in a manner that is analytical, predictive, repeatable, and practical.



Basic



Proficient



Advanced

### WAVE FORMS

I can distinguish between analog and digital waveforms in terms of their basic features.

I can measure waveforms generated by an electrical circuit and identify its features (e.g. duty cycle, period, frequency, etc.).

I can evaluate my circuit design through analyzing the waveforms.

### SIGNALS

I can distinguish between analog and digital signals in terms of their basic features.

I can explain input and output signals of an electrical circuit with correct diagrams and symbols.

I can infer criteria and constraints related to input and output signals to solve a design problem.

### CURRENT, VOLTAGE, CHARGE, ENERGY, POWER, & WORK

I can define current, voltage, charge, energy, power, and work.

I can explain the relationships between current, voltage, charge, energy, power, and work with mathematical models or diagrams.

I can calculate current, voltage, charge, energy, power, and work of an electrical circuit.