Circuits

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1 Components

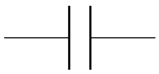
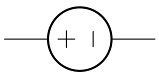
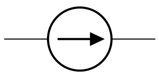
2 Equivalent Resistance

2.1 Series

$$R_{\text{eq}} = \sum R \tag{1}$$

2.2 Parallel

$$R_{\text{eq}} = \left[\sum \frac{1}{R}\right]^{-1} \tag{2}$$

	Resistor	R	Ohm	Ω
	Capacitor	C	Farad	F
	Inductor	L	Henry	H
	Voltage Source	V	Henry	V
	Current Source	I	Henry	A

3 Inductance

$$v = L\frac{di}{dt} \tag{3}$$

4 Capacitance

$$i = C\frac{dv}{dt} \tag{4}$$

5 Ohm's Law

$$V = IR \tag{5}$$

6 Watt's Law

$$P = IV \tag{6}$$

7 Kirchhoff's Laws

7.1 Kirchhoff's Current Law (KCL)

For all lines in and out of a junction:

$$\sum I = 0 \tag{7}$$

7.2 Kirchhoff's Voltage Law (KVL)

Around any closed loop circuit:

$$\sum V = 0 \tag{8}$$

8 Nodal Analysis

- Pick a reference node and treat as zero voltage (voltages are always relative)
- Use Kirchhoff's *current* law (KCL) in terms of voltage
- Into node $\implies$ $(+)$
- Out of node $\implies$ $(-)$

9 Loop Analysis

- Use Kirchhoff's *voltage* law (KVL) in terms of current